COMPUTER WEEKLY

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Briefing

Double 'first' for Shadow

ALTERGO'S Shadow II teleprocessing monitor has won a double first in a US user poll by becoming the first UK developed product and the first full function TP monitor to enter the Datapro annual software roll of honour.

Datapro bases its annual Honour Roll on US user ratings in areas including throughput and efficiency, ease of use, technical support and training, and overall satisfaction.

This year, the Datapro survey embraced some 2000 products of which only 30 were placed on the Honour Roll.

Micro factory

THE Wirral and Cumbria are among potential sites for the GEC/Fairchild semiconductor factory, GEC confirmed this week. Meanwhile, the country's other venture into high volume semiconductors, Inmos, has got into hot water. It placed a non-NEB approved recruitment ad. in Northern editions of the Guardian last week for staff for the Bristol area, where Inmos has a temporary centre (CW November 30). North-Eastern MPs are furious, accusing the company of trying to pre-empt a government decision. Inmos, however, says that a final decision about the location of factories has yet to be made.

Job fears

ACCELERATION of the System X programme by the Post Office (CW, July 27) has raised fears of sharp reductions in manpower requirements in the Post Office Engineering Union. Fred Herzal, who recently took over responsibility for the union's Committee B, covering external cable work, has asked the Post Office's technical headquarters for an urgent assessment of the manpower requirement for the next phase of its programme.

ICL exports

IN 1977 ICL exported £40 million more equipment than it imported, according to ICL managing director Dr Chris Wilson. This compares with the overall UK deficit of £200 million. Dr Wilson told a CSA meeting last week: "Without ICL and the CSA, the UK's balance of payments deficit in computer products would be £1,000 million in five years from now." He predicted that by then ICL would have 10% of the $15,000 million a year total market in Europe.

● Dr Wilson woos and warns CSA, page 11.

Profit forecast

RESULTS for 1977-78 are due from ICL at lunchtime today (Thursday). Forecasts from analysts are in the range £35 to £40 million profits on turnover of £500 to £520 million. Wood Mackenzie's Graham Meek is going for £38.9 million profit on £520 million turnover.

28,558 through the turnstiles at Compec

COMPEC 78 was an occasion for jollification as well as serious business, and Computer Weekly regional advertising managers Harry Aiken (left) and Ken Parrott (right) had plenty to smile about when Modular Technology's Buzly girls caught them on CW's stand at the show.

More fun was to be found at the Perkin-Elmer Data Systems stand, where visitors were invited to key in their forecast of overall attendance on an Interdata minicomputer.

As a result, Mrs J. Broadley, a programmer with Woolworth in Rochdale, is Tenerife-bound on a £500 holiday for two, as just reward for a remarkably accurate forecast. The actual figure was 28,558, almost double last year's 14,349, and Mrs Broadley's forecast of 28,567 was only nine out. The 1978 figure included 832 overseas visitors, three times as many as came to Compec 77.

● More Compec news and pictures: Pages 12/13.

Whitbread may put its own viewdata on the market

By Donald Kennett

A PRIVATE viewdata software package developed by Whitbread for in-house use has attracted so many inquiries that the big brewer is considering making a one-off sale of the marketing rights.

Whitbread's system has been running since the beginning of the year with eight adapted television sets on one site supplied by GEC and using separate modems. The next stage will be to add eight more terminals on remote sites.

Unlike the Post Office Prestel service, which is based on GEC 4080 minis, the Whitbread viewdata service uses Data General Novas and has been developed in close consultation with the GEC Hirst Research Centre at Wembley, which has been working on a low-cost Data General based viewdata system (CW, August 17).

A member of the Hirst viewdata team, GEC's Dr Edward Insan, said that the team is working with several firms which are developing their own systems. The team functions as a consultancy on viewdata systems and is also developing a total systems capability, offering all the necessary hardware and software for a viewdata network's terminals, computers and exchanges.

Whitbread project manager Doug Thornbury explained that the system functioned just like any computer based information network with the differences that modified TV sets were less off-putting to users than obvious

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DoI report backs Sir Keith's PO line

THE Post Office should allow freedom of equipment attachment to the public communications network, according to the National Committee on Computer Networks report, published last week.

Set up over two years ago to advise the Department of Industry on the policy for the installation and operation of computer networks, this conclusion is a political hot potato.

In an exclusive interview with Computer Weekly earlier this year (CW, April 27), Sir Keith Joseph committed a future Tory government to introducing legislation to free the Post Office monopoly as an urgent priority, particularly in relation to equipment attachments.

Frank Chapple, general secretary of the EETPU has agreed with Sir Keith (CW, August 17) but Bryan Stanley, general secretary of Post Office Engineering Union and a member of the NCCN, vigorously disagreed.

Any equipment from any manufacturer should be attachable, subject only to a simplified approval procedure to check that it would not damage the network or interfere with other users, the report recommended. This equipment would include modems.

Interconnection of private networks to the new data Packet Switched Service or the public telephone network should be allowed, the report recommends.

It also suggests that there should be licensing of a small number of companies to provide third party message switching services, to test the market and stimulate equipment suppliers.

John Carroll of the TCS bureau in Beckenham, welcomed the recommendations on behalf of the BCS Data Communications specialist group of which he is chairman. "We are very much in favour of freedom of equipment connection," he said, and added that he believed third party switching services had worked well in the US to keep down the cost of data transmission.

Robot guru

OUR Futureview editor, Robin Webster, has been roving the States interviewing some of the world's leading science fiction writers to help trace some maps of the future. This week he speaks to the guru of robot life, Isaac Asimov. See pages 20/21.

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Rate fears soothed

INITIAL fears among local authorities that a property rating revaluation, to be carried out by the Inland Revenue in 1982, would result in a phenomenal amount of keyboard input and manual checking of data, has been lessened following a meeting this week between local authorities and the Inland Revenue.

Originally, the Inland Revenue decided that all the revalued information, to be processed by a system code-named Valliet 82, would be distributed to local authorities in the form of print-outs, requiring a high volume of data prep.

However, the Inland Revenue said that now it has "every intention" of releasing the revaluation data on magnetic tapes.

Premier puts £100m into micros

DESPITE a rush of money towards the microelectronics industry, there is growing unrest at the lack of more reliable data on the impact of information technology on employment.

Last week, the Prime Minister unveiled another £100 million package of aid to micros (see page 19) and Education Minister Shirley Williams announced that the Science Research Council is to get an extra £10 million in addition to current commitments (CW, November 23) for research into industrial robotics, fault-tolerant systems, large databases, electron beam lithography, man-machine interface and other aspects of "micro" developments and use.

But the conclusion of a government Central Policy Review Staff "Think Tank" report on the impact of microelectronics that there has been an over-estimation of the impact of technology on employment has been attacked by Burrie Sherman, research director of the ASTMS union, as being a "series of unsubstantiated claims."

The Think Tank itself criticised the Sussex University Science Policy Research Unit study which concluded that there could be unemployment of about five million in the UK, largely due to the increased use of technology (CW, October 5). The Think Tank said the SPRU report over-estimated speed of implementation of micro systems and under-estimated the

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COMPUTERVIEW

Why Jim's micro smile is not enough

JOLLY Jim Callaghan has donned his Father Christmas outfit early this year and has liberally sprinkled more gold dust towards the "micro" world (see front page).

While any recognition of microelectronics as a key industry is welcome, it is time that the government and others obsessed by the mighty little chip started turning their attention to other important areas associated with information technology.

For the micro is meaningless without the forces of telecommunications and computing/information processing techniques which are the other elements of information technology plus the "brainware" to make them work.

As the information processing expert James Martin has pointed out (see page 3), one of the impacts of information technology is to put an emphasis on "intellect intensive" industries.

To some extent, the government has recognised this by earmarking some of the micro money for training and the government Think Tank has identified "skill shortages" as a major threat to Britain's future (CW, December 7).

But it must be emphasised that the skill shortages are not just in the development and use of microelectronics. The skills needed to carve a successful future for Britain include the need for good technical project managers and business analysts, Cobol programmers, engineers, network designers, and "teaching program" writers for *computer aided education*.

The importance of understanding that information technology is the real heart of the matter, not micros alone, is best illustrated by the need to have adequate wideband telecommunications capabilities as has been pointed out by the National Committee on Computer Networks (see front page).

As James Martin says, those countries which get a lead in telecommunications are likely to have a great economic advantage because it will enable them to implement and take advantage of information technology to improve industrial performance.

Ominously, however, he warned that the race to implement advanced wideband capabilities was a two-horse race between the US and Japan, with Europe far behind.

This is a view which Computerview accepts. By and large, European PTTs are far too nationalistic and slow moving. Even the British Post Office, which is one of the more advanced European PTT authorities in many aspects, has been seriously criticised by the NCCN for its slowness in introducing new services.

So, while the government is to be congratulated on at least catching up with one aspect of the modern world, pressure should be maintained to make it see the importance of other aspects of the technological revolution and to take appropriate action.

Privacy policy is vital

THE government's Data Protection Committee report (CW, December 7) is late, vague and does little more than pass the back to the yet-to-be-established Data Protection Authority to sort out the all-important details.

Computerview believes it is vital that the government acts quickly and coherently to formulate a national policy on the complex questions relating to privacy, data storage and transnational dataflow, because the implications of these issues are now of serious real concern throughout the world (See page 4).

At the same time, it is important that government avoids rushing into legislation which fails to take into account the practical implications of certain laws on the normal business of data processing.

The question of privacy should be seen as one which is independent of the means of information storage, but the nature of computerised storage and retrieval systems must be taken into detailed account before lumbering computer users with unnecessary and enormous costs that merely complicate the system without protecting individuals from public and private people and corporations with a valid password but evil intent.

Ten years ago...

COMPUTER WEEKLY DECEMBER 12, 1968

FIRST British vice-president of Honeywell Inc in the US was Ralph Price, chairman and managing director of Honeywell Controls Ltd . . . Using a Scicon 1108, economists used 1964 election opinion data to show that a new political party would be most successful based on the beliefs that all levels of taxation were too high, that giving money to underdeveloped countries was a waste, and that British leaders were born and trained to govern . . . The number of computers in Canada had increased from 500 to 2,000 in four years . . . Russian mathematicians engaged in developing equipment for nuclear accelerators attended a Chicago conference on the programming of automatic scanners.

THE smooth running of a college installation was suddenly interrupted when a line printer went haywire and began to produce random line feeds and page throws. It was immediately thought that there was bug in the software, but after considerable efforts the programmers had to give up without finding a solution.

Things began to get desperate until the time came for the printer ribbon to be changed. It was then noticed that the coded ring which controls the formatting had become worn and that two small holes had been pierced through it by the reading brushes. As a result when that part of the ring with the holes passed under the brushes random signals were generated which caused the paper to feed on.

The problem was solved with a piece of sticky tape which was used to seal the holes, and the installation went back to its normal smooth running.

● Winner of this week's £5 Interrupt prize is Bob Lo of University College, Cardiff.

Micro cash

● From front page

potential for the creation of new jobs.

A government Acard working party looking at the employment impact of new technology (CW, March 2) is still receiving submissions and is only due to report next spring and, from reliable reports, it appears has failed to undertake any major new study into this controversial area.

Meanwhile, the National Committee on Computer Networks has stressed the vital economic and social role played by the communications in developing wider use of distributed computer networks, including viewdata and computer aided learning systems.

FOCUS

Olympic-sized marathon

TWENTY years ago, the magazine Data Processing was forecasting the development of package computing. Few at that time could have foreseen the advent of the present day fully packaged exhibition.

However it was not just the systems on display last week which were fully packaged. Olympia was packed with visitors. In fact everything about the three day marathon came Olympic sized. More space than ever before enabled more visitors to see the many more stands.

Space, though, was at a premium on the first morning of the show, as visitors found themselves sharing the site with sundry carpenters, electricians, painters and harassed stand engineers.

It was noticeable, however, that one of the last stands to be completed was that of the Computer Aided Design Centre. Maybe next year they should upgrade their computer. Similarly late in completion was the Post Office Datel stand. The PO obviously believes in maintaining standards.

For what is possibly the least modern exhibition venue in the UK, Olympia was a pronounced success. Trade was brisk in all areas with particular emphasis on the micro traders.

Among the sundry Apples and Cherries, John McNulty of Modular Technology fame, was handing out tangerines. The Computrade Group were in the meantime, displaying their microelectronic wares from market barrows.

The presence in force of the micro dealers certainly enlivened the show. Crowd scenes resembling those of Ben Hur prevented all but the most determined to get within contact range of such stands as Jacquard Systems, McNulty certainly did not stop at handing out fruit. Apart from an electronic voice being on hand to greet customers, he had hired a troop of nubile Buztys.

Other fringe events included a more seasonably-attired Mother Christmas and the winners of the T-shirt peripherals stakes were the Computer Weekly Pets who, after close evaluation, I judged as being way out in front of their field.

Entertainment, though, was not limited to the micro market. Data Logic featured laser beam technology, Systems Industries introduced a revolutionary new ink-jet printer — presumably for those who fly Concorde, and BASF an interesting range in floppy equipment together with their much vaunted calendar.

One surprise of the show was perhaps the profusion of Honeywell stands.

Closer to home, one of the most well designed stands was that of Gamma, while the best designed plastic carriers were those of Data Logic, with Facit close runner-ups. Both varieties were strong enough to take the super Compec sized issues of Computer Weekly.

This year's exhibition was certainly value for management. Seldom could so much computer technology have been gathered together in one hall. The DPM could, in one visit, inspect rival products in full working mode.

Not all, however, was unconfined joy. Storage Technology were coping not only with a throng of OEM customers, but with an unremitting accumulation of dust. No doubt next year's models will feature dust impregnated matt finishes.

For a venue which is noted not only for viewing equipment but meeting former colleagues and friends, the catering was not in the admirable category. The traditional fare of pies and warm beer had to be consumed in sundry dingy stairways or grotty passages. Next year the organisers should perhaps back "chips with everything" with a few more tables and chairs.

'Back Britain's brainware' call by James Martin

BRITAIN should back its "brainware" to provide marketable and profitable systems for use on integrated information networks that will "revolutionise" *society*, according to world renowned information technology expert James Martin.

"Britain has the best communicators, *educators*, systems and software people in the world," he told Computer Weekly last week. Martin was in London to announce that he has signed an agreement with BIS-Deltak training organisation, who become his "video" publishers for audio-visual training material.

In particular, Martin emphasised that there was a great potential for the provision of educational software for use in computer aided learning systems, including viewdata, as well as on more traditional audio-visual media.

He predicted that the development of the video disc will provide a major breakthrough in education as it will offer the capability for providing automated multi media courses, including the visual "presence" of the educator.

Computer aided learning, he said, would free teachers to concentrate on the educational skills for which they are most needed.

The first James Martin course offered by Deltak is on distributed processing and will be followed by courses on telecommunications, data communications and networks, databases and office automation.

BIS-Deltak offers a "skills library" of audio-visual courses aimed primarily at teaching basic vocational skills in data processing, sales and general management and personal development techniques.

Commenting on the signing of Martin, BIS-Deltak managing director Roger Graham said that BIS-Deltak could now bring the existing practical learning material together with Martin's "*remarkable* understanding of the direction and effects of changes in technology" to give people in the DP industry a clearer idea of where they are going.

Martin was formerly a top consultant with IBM and has just had published his first report in a Public Report series called Computer Networks and Distributed Processing.

● BIS-Deltak expects to do £14 million business in the current year, growing to £30 million in three years.

Bonus talks avert council shutdown

FOLLOWING a meeting of council and Nalgo union *representatives* last week, computer staff at Gloucestershire County Council have removed the threat of a shutdown of the ICL 1904S system there.

The staff were seeking bonus payments to more people during the conversion from the ICL machine to a Honeywell Level 6.

Terry Hobson, the county council treasurer, said: "Bonus payments were being made to those who have a dual responsibility during the changeover and the only problem is to what extent these payments are made.

"Initially, a rather strong motion was put forward by the computer staff, saying that they would not operate in the two modes of conversion, but this has now been withdrawn."

Applications handled by the ICL machine include all the general council accounting systems, including payroll.

O'Heron leaves ICL and heads for the West

ICL is to lose one of its most colourful, dynamic and controversial figures next month when Brian O'Heron leaves the company and moves to the West Coast of America to seek his fortune as president of a "little," as yet unnamed, computer company.

Brought in by newly-appointed managing director Geoff Cross in 1972 as his quick-firing, roving "troubleshooter," O'Heron had a close involvement in the frontline implementation of some of the abrasive and radical policies introduced by Cross which were aimed at reshaping ICL and giving it a new cohesion and increased profitability.

"Geoff deserves all the credit for pulling ICL together and getting it going. In Chris Wilson ICL has a man who will keep that momentum and growth going," he commented.

Now, O'Heron believes, he has fully played his role in the re-styling of ICL.

"I feel like a lion-tamer without a lion," O'Heron told Computer Weekly, reflecting his relish for new and difficult challenges.

Born and brought up in Connecticut, O'Heron always planned to return to the US, although he has spent almost 13 of the last 14 years based in the UK with Univac, and then ICL.

He said he feels an increasingly strong pull towards the sunshine and entrepreneurial spirit of his homeland.

"I have worked in big companies for a long time and I am now looking forward to being president of a little company in which I have a financial stake," he said.

O'Heron formed a close working partnership with Cross and Ed Mack, currently ICL's product development director, when all three worked at Univac.

Last year, Cross left ICL, also heading to the West Coast, where he is currently acting as a "company prospector" for GEC.

It seems a strong possibility that O'Heron will team up again with Cross, who recommended the recent GEC takeover of office equipment manufacturer A. B. Dick of Chicago (CW, November 23).

However, O'Heron said it was unlikely that he would move to A. B. Dick and stressed that, at this stage, he was considering a number of options and had yet to make firm plans.

For the last few years, O'Heron has been in charge of the development of the 2900 VME/B and, more particularly, the VME/K operating systems.

VME/K had hit a number of development problems in its early days and seeing it through to its current stage, about six to nine months from the release of the first full version, KSV 16 (CW, October 26), was his last troubleshooting job for ICL.

On reflection, he believes his most significant achievement in the early days of the Cross regime was to help increase the status and rewards of the ICL technical staff.

O'HERON . . . "I feel like a lion-tamer without a lion."

Threat to EMI

A VOICE recognition system that could prove a serious competitor for the EMI Threshold range of terminals is now being developed by ITT. It is based on the Time Encoded Speech voice digitising technique pioneered at Bath University (CW, December 7).

***TES looks* at a sound wave between a pair of zero points and generates a "symbol" consisting of two numbers — one relating to the time interval of the wave and the other to its shape. The technique assumes that waveforms with similar shapes all sound the same to the human ear. ITT has acquired the relevant TES patents.**

EEC rebuffs claims that US database operators blacked from Euronet

CLAIMS that US database operators were to be excluded from Euronet for political reasons were rebuffed last week by Barry Mahon, from the EEC Diane team, who said that there were technical difficulties that would probably last two years.

At the same time Roger Summit, director of the Lockheed retrieval service, expressed scepticism that there could be technical problems in a field where so much other interconnection is already going on.

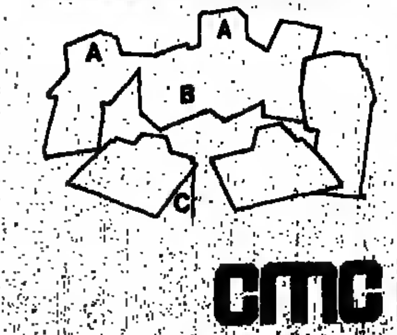
According to Mahon, the CEPT has agreed that US networks will be connected, but no standard for interfacing separate networks has yet been agreed. No negotiations have yet been held with official US bodies, he said, and so agreement is probably two years away. In particular, the European PTT want to be able to monitor the interface traffic.

It would be possible, Mahon said, for a US operator to lease a line across the Atlantic just for the purpose of connecting to Euronet, but the European PTTs would insist that this be done in such a way that it would be impossible for someone to use this line as a "back door" into the rest of the US network rather than just for information retrieval. This, Mahon suggested, would not be economical.

It would be contrary to the Treaty of Rome, Mahon said, for US operators to be excluded. As an aside, he added that when microprocessor switching is upon us it will be very difficult for the Post Offices to control who is switching what to where, but in the meantime they wanted to regulate all switching.

Diane (Direct Information Access Network for Europe) is the collective name for all the database retrieval services that will be offered on Euronet, among which will be Blaise, InfoLine, IRS from the European Space Agency, and many others.

Trials start next March, and commercial operations should follow in the summer. Usage charges for the network will be much lower than those of competing networks, as it has been financed by a grant of 17 million French francs from the EEC.



Downtime

by Chad

ABOVE is a photograph of one of Intel's latest products, the 2732 32K bit ultraviolet erasable read-only memory, which the company claims offers the lowest power dissipation of any device of the type available on the market today. As the observant will have noticed, it is also a photograph of an elephant.

I presume that such juxtaposition is intentional, and has some inner meaning of great import. But what can it be?

Two possible answers have so far occurred to me. The first is that the Intel memory, unlike the elephant's, can be made to "forget". Exposure to UV radiation will do the trick, and leave the device ready for further information. Such exposure for the elephant will certainly erase its memory, but will unfortunately leave it too dead to remember much else.

The second answer is that, though I don't actually know the power dissipation of an elephant in milliwatts, I feel safe in assuming it is considerably greater than that of the Intel part — 24 microwatts per bit in the active state.

Intel therefore wins the contest by two falls to nil.

Unshowing the flag

SAD to say, politics is invading even the rarefied world of microelectronics. Electronics News reports that the Chinese delegation which has been stomping across Europe on a high-technology fact-finding mission staged an unseemly row when they spotted a Taiwanese flag at the Electronica show in Munich.

They had been fascinated by microprocessors for use in consumer products, but on seeing the hated Nationalist Chinese flag flying with those of all the other nations with goods on show, instantly threatened to leave the exhibition.

Commercial considerations took precedence over principle, and the offending flag was removed, whereupon the mollified Marxist-Leninists resumed their tour.

Martin Banks, poring over his calculator, announces: "In Europe last week £700 million was committed to the microprocessor!" My reaction? *I hope it's bloody grateful.*

Data regulations is no longer just an issue of personal privacy — it involves national sovereignty, world trade, and world development. Representatives of most of the major multinational companies met in New York recently with government officials from Europe and North and South America to find out about each others' concerns. RORY JOHNSTON reports on how they managed — or failed — to clear up some of the confusion.

Unanswered questions about data flow regulation

PLENTY of questions but few answers were the main feature of Online's conference in New York on "Data Regulation — European and Third World Realities". An impressive array of speakers, which included senior representatives from nearly all the government bodies around the world that are dealing with privacy, provided the delegates with plenty of information about their activities but failed to answer the most difficult and important questions.

The delegates were mainly from large American multinational companies, who were very worried about the effect various countries' controls on privacy and cross-border data flow would have on their ability to do business.

The questions they were asking were, "How exactly will crossborder controls operate? How do governments intend to combat "data smuggling", either by telephone line or by transportation of storage media? Exactly what affect will these controls have on business, and the abilities of companies ('whose lifeblood is information,' as one delegate put it) to manage themselves? What is the US government going to do to protect its firms' interests? Are laws going to stifle the free flow of knowledge and ideas that is essential to world development, or will they encourage it?"

Rick Naustadt

Frits Hondius, who heads the Council of Europe's work on privacy, described the wide range of laws that European governments have passed or are working on, to control computer files and prevent personal information being sent abroad to countries where such controls are less stringent. Sweden, Germany, France, Norway, Denmark and Austria have legislation already in operation; Belgium, Luxembourg, the Netherlands and Spain are expected to follow fairly soon; and Italy, Switzerland and the UK are still some way off.

Outside Europe, the US and Canada have privacy laws which so far control only government files, not private sector ones. The Communist countries are not really interested in the issue, naturally, but there has been some legislation in Hungary since 1976, and recently a 100-man working group on computers and legislation has been formed in Moscow.

Personal privacy is not the only motivation that governments have for imposing cross-border controls. Some countries want to control data flows for local economic reasons, such as protecting their own DP industries. Canada is particularly worried about DP work being lost to US timesharing services. The other issue comes under the general area of "national sovereignty" — governments, particularly in the Third World, wanting to control the information delivery systems in their countries, particularly the news media.

Brazil is already doing this, requiring all overseas computer telecommunications links to be vetted before going into operation. This involves answering several pages of detailed questions about the system, and a wait of between six and nine months for approval.

Ricardo Saur, head of Brazil's coordinating committee for DP, in giving the conference his government's justification for this, said they were particularly concerned about the "superfluous technology" problem — bringing in the latest equipment for its own sake, regardless of the effect on balance payments and employment. The "less developed countries" are more concerned about food than privacy, he said, but they want to be part of the world decision-making process.

One representative of a US company operating in Brazil admitted privately that his firm, unable to wait nine months for approval of links, was sending data back to the US by Telex, thereby bypassing the regulations, as Telex is not controlled. This was the only way they could get their work done, he said.

Jon Freese, director general of the Swedish Data Inspection Board, expressed his general philosophy thus: "You must regulate the free flow of data so it will flow free." He also stated that there is no difference between transporting people by plane and data by telephone, a highly dubious notion in the view of some of the technical people present.

Two separate international organisations, the Council of Europe and the Organisation for Economic Co-operation and Development, are both working on schemes for harmonising different countries' data laws to simplify the problems of data flow control.

According to Frits Hondius, the Council of Europe is in the process of drafting a convention that would control the privacy of individuals in member states with respect to both public and private files. There would be a common core of provisions in this that all member states would have to accept, and other parts they could accept or waive as they chose.

Ideally, the provisions would be "self-executing", that is, they would not have to be ratified by legislation in each country but would provide a way for each citizen to enforce his own rights through the courts. One difficulty still to be solved is, in which country does one go to court in order to do this?

Hans-Peter Gassman from OECD described the "Expert Group" set up by his organisation earlier this year to draft guidelines on privacy; he assured the delegates that "good co-operation" is going on between the OECD and the Council of Europe to see that their two sets of rules do not conflict.

The US delegates were very concerned that all these conventions were being drawn up while their representatives overseas had no policy to work with, while the government at home was doing nothing.

Replying to this, Rick Neustadt, an assistant director on the White House policy staff, said that business had so far made a bad job of identifying the real problems involved, and pleaded for more hard evidence — "horror stories" of the effects on business of privacy laws. Both he and William Fishman, from the new National Telecommunications and Information Administration, clearly demonstrated their eagerness to please, and assured the delegates that policies were on their way.

One of the more strident voices from the floor of the conference was that of Herb Grosch, former president of the ACM. While respecting people's concern for privacy, he said, there was no way that the controllers could keep up with technology. For instance, he asked, how was it going to be possible to stop data smuggling when bubble memories allowed one to carry many Megabytes in one's pocket? Sadly, his light-hearted manner led to his remarks being treated as a joke, and he got no answer to this interesting question from the panel.

H. E. Marks from Adapso expressed very serious concern that privacy laws provided a much greater potential for violation of human rights than the absence of such laws. If governments had the right to set security standards, he said, they would be able to pry into all databases and all messages without hindrance.

● The conference proceedings are to be published by Online Conferences, Uxbridge.

The Third World is invited to the dance

ONE issue that was rumbling in the background throughout the conference was that of the "New World Information Order", a notion that was first raised in a report to the US Senate by George Kroloff. Third World countries, Kroloff pointed out, are getting increasingly militant about what they see as domination by Western information — Western news media, Western wire services, Western computer networks and databanks.

More and more, these countries are going to try to take over control of the information channels feeding to and from them. This attitude, abhorrent to the West where freedom of speech is a sacred right, was eloquently defended by Christopher Nascimento, a cabinet minister from Guyana. He said his government had a major problem of "emancipation of people's minds" from "colonial" items and to do this it had to control all the media. "A state is not sovereign if the information delivery systems are foreign-owned," he said.

Adrian Norman from the consultants Arthur D. Little proposed that we should accept that other countries are going to insist on being able to censor all information crossing their borders, and put forward a plan for a worldwide standard communications system in which every message, although enciphered, would have a tag on it so that its origin would be known and it could be vetted by the receiving government.

Roland Homet, who is with the US International Communications Agency (formerly the US Information Service), made an impassioned and somewhat sentimental plea for the West to pay more attention to other people's values. One of his more improbable suggestions was: "Perhaps some of our Third World friends can aid us, by guiding us into a reminder of the lilting 18th century chansons and country dances from which the stately cadences of the 18th century gavotte were drawn."

First of 'intelligent copiers' announced by Wang

WANG'S xerographic printer, the first of the "intelligent copiers" forecast by Computer Weekly (August 24), has now been officially announced. It provides typewriter-quality printing for word processing and DP at a speed of 18 pages a minute and a US cost of $35,000.

Three different type founts can be used, two of which can appear together on the same page, even on the same line. The Wang Image Printer, as it is called, can also be used as a convenience copier; it has a glass plate on the top which serves as a document reading station, as with other copiers.

At present it can be used only with other Wang equipment — a 110 series word processor or any Wang minicomputer. Standard interfaces for OEM use are still some way off. As printing can be either "portrait" or "landscape" it is practical for DP applications, providing up to 180 characters across the page. Character spacing can be 10, 12 or 15 to the inch, or proportional.

Wang word processors have a collating facility and this, together with the high speed of the Image Printer, make it practical to produce serveral copies of multi-page documents on the machine, fully collated, eliminating separate copying and collating.

A Wang spokesman said, "The speed and convenience of this will change the way offices operate."

The characters are produced on the face of a CRT, and transferred to the photoreceptor by optical fibres. Resolution is 300 dots per inch, giving each character a matrix of 30 x 30, which gives quality as good as a carbon ribbon typewriter but not as good as photocomposition. The machine is basically a Japanese Ubix copier with electronics added by Wang.

The photoreceptor, in most copiers the part most susceptible to damage, is a disposable, flexible belt, which can be replaced, Wang claims, in one minute. It should be replaced every 2,000 copies, or whenever it gets scratched, the company says.

The Image Printer will be on show at Hanover Fair next April. First deliveries in the US will be in March, and in Europe, in the summer.

IBM at work on ten-fold increase in densities

IBM is working on developments in semiconductor process technology that will increase memory densities by a factor of four, and logic circuit densities by a factor approaching six. The full potential of the development work could be a ten-fold increase in densities with nearly four times faster processing speeds.

The work, being carried out at the company's Thomas J. Watson Research Centre in Yorktown Heights, New York, is exploring all aspects of shrinking the geometries of integrated circuits to 1 micron and under. The technology has been described by the company at the International Electron Devices Meeting, recently held in Washington.

IBM is certainly pushing very hard at the state-of-the art in semiconductor technology, after appearing earlier this year to be falling behind. It has jumped into the high density RAM market, with the announcement of a 64K bit RAM, and is also due to take out licences on the Japanese work to achieve VLSI devices.

This Japanese work parallels the efforts now seen to be underway within IBM itself.

The work is currently being based on MOS technology that uses polycrystalline silicon gates. It is estimated that the technology will make possible memory chips containing 256K bits, and logic devices holding more than 10,000 individual logic gates.

The work includes not only device design, but also the development of new lithographic and fabrication processes. Test results have already shown that devices can be fabricated successfully, and perform as expected.

The operating speed of systems using such components will be spectacularly fast. The switching speed of the basic circuit is 230 picoseconds.

In a more typical systems configuration, categorised in the papers as a fan-in and fan-out of three, the switching speed is 1.1 nanoseconds. Power dissipation is quoted at 0.17 milliwatts per logic element.

Experiments have also been carried out at liquid nitrogen temperatures, something IBM is becoming increasingly interested in with its work in superconducting Josephson junctions and photochemical memory systems. Here, the switching speed is increased by about three times, IBM quoting 400 picoseconds for the "systems" configuration.

In addition to special test circuits to define the capabilities of the process, IBM has already developed an experimental programmable logic array using the new technology, which has locations for up to 4,000 logic switches. Test results on this are expected early next year.

The lithographic process developed for the production of these devices is based on a computer controlled electron-beam system. This is capable of controlling line widths to within 0.1 micron, and registration of the various levels in the process to within 0.3 microns.

Exposure of the wafer to the electron beam is completely automatic, and each chip location carries registration marks that emit secondary electrons which are recognised by the system and used to register the beam for that chip.

This is particularly useful as the system is capable of producing several different chips on a single 2.25 inch wafer. Currently, the chips being processed are about 28,000 square mils in area.

Online news system for White House

STARTING up this week is a new online retrieval service on current affairs developed specially for President Carter's staff at the White House by the New York Times Information Bank. Called the Issues Monitoring System, this will provide selections for news stories about a specific set of issues of major political importance, and will be available to the general public in January.

Development of the system was commissioned by the White House and will be used by staff there and at the major government agencies, via dial-up terminals and a leased line between a Washington node and the computer just outside New York. It uses the same computer as the existing NYT Information Bank service (CW, March 2) but different software, designed for much simpler operation.

A separate database from the main NYT bank is also used. This is selected by abstractors from the main newspapers and magazines, together with the AP Washington Wire Service, the Congressional Record and the like, according to a list of issues specified by the White House as those it is particularly interested in. Only important stories are included, and each item is output in a very concise format.

SDI, Selective Dissemination of Information, can be provided, so that an official can ask for items on specific issues to be trapped and sent to him automatically, on a regular basis. Large numbers of items can be dumped to magnetic tape and then transferred for printing on the Xerox "intelligent copier" equipment that is on trial at the White House (CW, August 24 and November 16).

According to Carl Keil, president of the Information Bank, part or all of the main NYT bank will be put up on a machine on Euronet within the next six months, making it available to European users much more cheaply than at present. Updating will be less frequent than with the US Bank. Magnetic tapes will be sent across once or twice a week.

Pertec wins $7.5m contracts

PERTEC has announced that it has won contracts worth $7.5 million in the US for its peripheral products. One customer, Univac, will be supplied with tape drives under a five-year $2.8 million contract, while Lear Siegler is buying $3.5 million worth of disc drives from Pertec over two years. The Data Card Corp is buying tape drives worth $1.2 million.

GEC plans multiple attack

TAKING the plunge into the business systems market, GEC Computers is planning an all-fronts attack, selling both to the end user and through software and OEM systems builders. The new GEC 4060 model is available packaged into a desk for the office environment, and languages available include RPG II and Basic, with Cobol ready early next year.

First customer to sign for the 4060 is Ian Martin Computers Ltd (CW, November 30). A subsidiary of Ian Martin Associates of Toronto, the High Wycombe-based company is planning to offer a 4000-series bureau service as well as selling business systems based on the line, and technical director J. W. Eardley is enthusiastic about the line.

"The 4060 is comparable in power with the DEC PDP-11/34, and the 4082 goes above the PDP-11/70," he told Computer Weekly.

GEC Computers' second plant at Dunstable is nearly ready for occupation, and it is now planning to add a third facility there.

'1½m jobless cost £10bn a year'

A CALL for a shorter working week to reduce unemployment is one of the central ideas in a report called "The Future of Employment in Engineering and Manufacturing" from the Centre for Alternative Industrial and Technological Systems at North East London Poly.

The report claims that the true cost of 1½ million unemployed is more than £10 billion a year including administrative costs, redundancy payments, and lost production.

CPP gets German DOS/VS, OS aids

RIGHTS to two relatively unknown West German-developed software products — one a DOS/VS performance monitor, the other an OS operations aid — have been acquired by Computer Program Products as the first step in a projected broadening of the group's operation.

CPP, which is the software products arm of the CAP-CPP group, has in the past marketed and supported products under licence from US suppliers — principally ADR and Boole and Babbage.

It now plans to add software product development to its activities and may take a special interest in products designed explicitly to satisfy European needs.

Commenting on the more aggressive market posture, CPP general manager Sandy Cormack said: "We have developed to such a size and capacity that we can not only identify areas of market need, but can actively seek out and develop products to meet these requirements".

The first development likely to be undertaken is the enhancement of Improve, a DOS/VS performance monitor bought by CPP from BFD, a small West German software house.

This is the first product to be wholly owned by CPP, which will thus have complete control for the first time over worldwide marketing and development of one of its software systems.

A program (rather than a system) performance monitor, Improve is loaded per DOS/VS partition. By sampling program activity every few milliseconds, it relates specific instructions to periods of high resource usage, ultimately producing a histogram plotted against time.

Operable with any language, the system is applicable both to the evaluation of existing operational programs and to monitoring the efficiency of programs being developed.

CPP has taken only European rights to the other new product, Pecs. Developed by Sven, of Hamburg, Pecs is an automated production system based on a database of job control and other job specification data.

This constitutes the master plan for data centre operations, which can be prepared for execution by the specification of currently-applicable information and data.

A particularly attractive feature of the system is that via a technique called reference management, symbolic parameters can be managed and resolved before jobs are dispatched for processing. One result of this is that output listings no longer contain substitute JCL lines.

A permanent licence for Pecs is £13,950 for MVS and £9,950 for all other versions of OS (including non-VS versions).

Improve is priced according to processor, starting at £1,950 on a 370/115, and rising in steps of £1,000 with the second digit of the serial number to a maximum of £5,950 on a 370/155, 158, or 303X.

Macro 4's Speed on general release

FOLLOWING a two-year period in which it released the product to selected customers only, Macro 4 is making its DOS/VS resource management system Speed generally available. At the same time, the product has been named Speed^2, pronounced Speed-two, in recognition of its newly extended capabilities.

Speed was originally aimed at speeding up sequential processing of disc files. This it achieves by a technique of Stream I/O whereby a single I/O operation is not restricted to reading or writing one block, but can transfer all the blocks in one or more tracks, up to five.

While Stream I/O is still a major feature of the package, Speed^2 has a number of complementary and related features.

Most obviously connected is what Macro 4 terms "core phasing". By this it means that the stream I/O areas reserved by Speed^2 are not fixed in size, but are expanded or contracted according to the availability of real memory.

The allocation of space to stream I/O is controlled by monitoring the system paging rate. When the rate is zero or falling, more space is taken; conversely, when the paging rate is rising, space is released.

Speed^2 is therefore claimed to balance stream I/O automatically to optimise system performance.

Another major feature is automatic disc reblocking. Using a standard block size specified by the user at start-up, the package automatically loads each block with an optimum number of logical records.

Offering significant economies when converting to a new disc type, the feature eliminates the need for program modifications for larger block sizes.

Speed^2 is priced at between £65 and £135 per month.

PROGRAMMER NOTES

Why assertions in Cobol form the ideal comment

A SURPRISING aspect of the Cobol REDEFINES clause has been brought to light by a reader's response to our call for comments on the use of assertions and invariants (Programmer Notes, November 23).

Dick Botting, who writes from the computer science department at Brunel University, notes that he has been using assertions since around 1969.

"Assertions," he says, "form the ideal comment. They explain the intended effect of code by defining what relationships you expect to be true at certain points in the program.

"For example, whenever you repeat something several times, it should always be possible to identify something constant at the top of the loop — some relationship between the variables."

Botting notes that such an assertion is not always easy to find. Further, once found it can still be a problem to express the assertion clearly and unambiguously. Finally, there is no compile-time or run-time system to *prove* the asserted invariance.

Nevertheless, he argues, the method, though subtle, is useful, and once one has grasped the idea, it can be applied to programs in any language.

One of the high-points in his experience with the technique was the discovery that the Cobol REDEFINES could be used to guarantee the truth of certain assertions in a way impossible in most languages.

"Many people, especially academics, regard REDEFINES as an obscure and dirty trick to save store. It can be used, though, to establish an invariant relationship between variables that one would have to work to achieve in a language such as Algol or Pascal."

One example cited by Botting arose from the classical "coin analysis" problem.

"Here, the variables POUNDS, PENCE, and MONEY should always satisfy the relationship (Pounds + Pence)/100 Money. The ideal way to ensure this invariance is to define MONEY as, say, PIC 999V99 and then redefine it as POUNDS, PIC 999, followed by PENCE, PIC 99."

The assertion of invariance, Botting says in conclusion, is a valid and useful program proving technique, which can sometimes give unique insight into a problem.

"Like a Pozidrive screwdriver in a toolkit, one day you're going to need it."

GILB'S MYTHODOLOGY

Would you dare use a cassette for documentation?

WHAT would you say if I suggested that we should document our programs, for maintenance purposes, with tape cassettes, rather than with conventional documentation?

I know how you would react, because I have tried out the idea on my course participants. Nobody takes me seriously and everybody has the same list of reasons why it wouldn't work.

Fortunately, not everybody dismisses new ideas that easily. And some people even try to get some hard facts to counteract their often misleading intuition.

R. W. Elliot and E. R. Story reported their measured experiences in the US DPMA publication Data Management in November 1975 in an article, "Audio techniques for program documentation."

Since I have never come into contact, even in the US, with people who read and remembered the article, I think it is appropriate to bring up the subject as a "new idea" here in my column.

The documentation is read into a cassette, and a written page index over the contents is prepared showing the various subjects and the tape meter reading, for fast skipping to the required part of the documentation.

The question of updating is not handled explicitly; but if the volume is small, I assume a page or so of changes, together with the contents page, should do the trick until a more thorough re-speak is necessary.

In any case one of the assertions from this study is that the cost of producing the tapes is only one fourth the cost of producing conventional written documentation. So in the worst case you could afford to re-speak the whole documentation four times without exceeding your present initial documentation costs.

The cost was an important factor in encouraging Elliot and Story to check out the effectiveness, for maintenance purposes, of this documentation form.

What is your personal guess as to the relative effectiveness of a tape cassette as opposed to conventional written documentation?

I think you have guessed wrong. I certainly would have, which is what makes the reported results so interesting.

They set up an experiment using 12 application programmers. Two different 360 Assembler language programs of about 300 statements in length were written. These were documented by both conventional written and unconventional audio documentation.

Each programmer was given a maintenance problem to solve for each of the programs, and given alternately audio documentation for the one program and written documentation for the other.

In such an experiment we would expect the unfamiliar method to perform worse, simply due to lack of experience or learning, though sometimes there is a Hawthorne Effect, or new-change effect, for new methods which must be accounted for too. It usually favours the new methods.

The time in minutes for each programmer's two maintenance attempts was noted. In summary the total audio time was 492 minutes and the total time using written documentation was 524 minutes, slightly more, but no significant difference was measurable. Be careful, maybe nobody looked at any of the documentation sets!

Conclusion? Well, maybe you ought to give it a try, instead of screaming for more programmers.

Has it occurred to you yet what might happen if we let programmers record their brilliant logical tricks for future generations on a TV tape?

Some are admittedly shy, but they could be allowed to turn their face from the camera, or point to the program listing or something. The rest, might just fancy a bit of immortality.

Puzzler

ONE of the most interesting facts discovered by medieval numerologists was the existence of a Magic Multiplier, with four figures, that enables "the sum of all the numbers that can be formed with any given set of four different digits (0 being excluded), each digit appearing only once in each number," to be determined in one simple calculation.

All that needs doing is to add the four digits together, and multiply the result by -,---. Can you work out this Multiplier before turning to page 45?

● Gilbert Watts, senior programmer in the computer services department at Manchester Polytechnic, has put forward an alternative approach to solving the problem which called for one light coin out of 27 to be identified in three weighings (CW, October 19).

Mr Watts also comments: "My solution has the merit that the generalisation to a maximum of 3^n coins, for n weighings, is immediately obvious."

SOFT BITS

Library for HP 3000s

THE Hewlett-Packard 3000 is the latest machine for which International Mathematical and Statistical Libraries Inc has produced a version of its Fortran sub-routine library. Written in HP's Fortran/3000, the routines run on both Series II and Series III 3000 systems.

FOUR new installations were made in October of Gemini Oliver, the Cics storage protection, testing, and programming debugging aid (Software File, April 27). Among those taking the package was Cheshire County Council, which runs it under OS/VS on a 370/148 with interfaces to Cincom's Total and IBM's Stairs. UK users now exceed 20.

ITALY'S largest telephone company, the Società Italiana per l'Esercito Telefonico, has bought Informatics' Mark IV system for use at seven DP sites. It will use the package to develop applications compatible across IBM 370 and Siemens 4004 hardware running under a variety of operating systems.

HAVING chalked up total revenues in excess of $10 million worldwide in its last financial year (Software File, October 5) Pansophic has announced that its European subsidiary, Pansophic Systems Europe Inc, achieved record sales of $1 million in the first three months, ended October 31, of its current fiscal year.

'Fortran will survive,' BCS told

"FORTRAN is a dirty word. It contains so many language features that we now abhor — such as GOTOs, and numeric statement labels — that you will find almost no-one to say it is a good language. You won't find any professors of computer science teaching it or advocating its use, and manufacturers have no particular vested interest in it either," said former Ansi boss Frank Engel.

"Yet despite everyone being against it, it continues to survive and even grow. Why?

"The answer I suggest is pragmatic. Fortran is not elegant, but it gets things done, and it gets them done effectively. While computer scientists won't in general teach it, engineers do, and so do some business schools.

"Part of its popularity is that compilers — and programmers who know the language — are very widely available. You also get a pretty good performance from most systems."

Speaking at the BCS's Fortran Forum 78 (CW, December 7), Engel described how he had several times anticipated the "demise" of Fortran only to be confronted with its vigorous "resurrection."

He enlarged on this theme in a discussion with Computer Weekly on his experience of the history of language development.

"The first time I saw the end of the road for Fortran was in 1958, when the International Algebraic Language Committee devised Algol. We in Share — the IBM large systems user group — decided at that point to adopt Algol as a replacement for Fortran."

Fortran was at that time exclusively an IBM product, and concurrently with voting to adopt Algol, Share adopted a resolution that there would be no further development of Fortran.

"Share then enjoyed a much closer relationship with IBM than it does now. We couldn't say to the company 'You can't do anything more with Fortran,' but we did have influence.

"For example, we had been able to get IBM to implement an operating system for the 709 that members of the user group had designed. This was the SOS system, on which a 12-man design team had started work in 1956."

Share was not, however, successful in getting Algol implemented, though it tried till about 1960.

Concurrently, moreover, many members had become aware of the defects of Algol 58, not all of which — in their view — were corrected in Algol 60.

As a result, Share late in 1960 reversed its earlier decision and looked once more at Fortran.

Re-entrant Fortran, Pascal for Univac V77 mini

AN operating system called Summit, featuring re-entrant Fortran 77, and Pascal language processors has been announced with the V77/800 minicomputer from Univac (see back page).

Summit incorporates many of the optional software packages such as the Pronto teleprocessing monitor offered with the V77 Vortex operating system, but standard programs written under Vortex can be run under Summit without recompilation.

Key features of Summit are a firmware accelerator for task despatching, more comprehensive file structures, including standard multi-volume file support, enhanced tools for program development from terminals.

Similar facilities have also been announced for users of Vortex and Pronto, in a new CP77 control program, which offers job submission for compilation and execution of foreground and background jobs from up to 12 terminals. CP77 is available on the V77/800, 600 and 400 models, and Summit is offered with the 800 and 600.

Summit also features a new Query/Update language, QL/77, for use with the Total database management system, and the file access method provides security for the first time.

A V77/800 with accelerator firmware and floating point processor is necessary to run the Fortran 77 language processor.

The full range of V77 Vortex languages, comprising Cobol, Fortran IV, RPG II and the V77 Assembler are also available under Summit.

Univac has also announced comprehensive software to integrate V77/800 and 800 models into its standard distributed communications architecture, DCA.

V77 DCA supports both Univac Uniscope and UTS terminals, and IBM 3270, and enables a V77 mini to be used as a termination in a DCA network as an alternative to a standard Univac or IBM terminal. It does not impact the role of the specialised Univac DCP communications processor.

SAS, Iberia in airline material control system

A MATERIAL control system designed particularly for airline use is to be developed by Sperry Univac in a co-operative agreement with two European airlines. When complete, the software — for use on the 1100/80 — will be available as a module of Univac's standard airline system.

Called Mats, the new system will be an enhanced version of that already used by one of the airlines, SAS (Scandinavian Airlines System). At present it operates a Mats system on Univac 494 processors, controlling around 200,000 spare part types stocked in Copenhagen, Oslo, and Stockholm.

Installing the system for the first time will be Iberia, the other partner to the agreement. Iberia already uses three 494 systems for real time applications and has ordered a fourth to run Mats until the 1100/80 implementation is ready.

1100/80 systems have already been installed by SAS and have been ordered by Iberia.

Work on the new Mats version is being undertaken jointly by Sperry Univac and its Scandinavian joint venture company, Saab Univac. Estimated at 18 man-years, the development project will be based at Madrid.

The principal function of Mats is to ensure adequate availability of spare parts at each workshop. In addition to monitoring stock levels, it controls and records the issue of parts, generating purchase orders automatically when stocks are about to run out.

Where the supplier has appropriate communications equipment, the system can place orders directly with the supplier's computer.

Larger offices

LARGER offices in Maidenhead have been taken by Computer Associates, close to its previous base in Park Street. The new address is St Mary's House, 16/20 High Street, Maidenhead, Berks. Tel: 0628-70911.

[illegible]

OP SPOT

By Bernard Allen

HINT OF THE WEEK

Interdependent job suite communication

THE George 2+ operating system provides no means for communication between job suites which are running in parallel.

This is unfortunate, for when suites are interdependent the operator often has to manually suspend and restart programs; an unsatisfactory procedure, as it invites errors.

By the skilful use of macros the process may be carried out automatically. This method is far more efficient and has the added benefit of making the operator's task that bit easier.

An example of what can be achieved is sent by Alan Beckley, who is employed in the technical planning section at the Littlewick Green, Berkshire, installation of Black and Decker.

Says Beckley, "When an element of a suite has to be suspended until a particular program in a parallel suite has been run, a special erase macro should precede the program to be suspended." He gives the following macro, which is called CHECKERASE:

```
MACDEF    CHECKERASE
UP        16
UP        17
GOT       9AB2
9AB1
WAIT      60
9AB2
CEFAIL    9AB1
ER        %A<FILE1>
DOWN      16
DOWN      17
ENDMAC    CHECKERASE
```

This macro attempts to erase a file called FILE1, which will only exist if the program on which this depends has been run. If that is not the case, CHECKERASE is suspended and attempts to erase FILE1 every 60 seconds.

He explains, "A special create macro must follow the program which must finish before the suspended suite can restart."

He gives the following macro, called CHECKCREATE:

```
MACDEF           CHECK-
                 CREATE
UP               16
UP               17
9ST
CEFAIL           9AB
CE%A<FILE1>      (0)(*DA,B)
GOT              9EN
9AB              GOT 9ST(10)
ABANDON
9EN
DOWN             16
DOWN             17
ENDMAC           CHECK-
                 CREATE
```

Says Beckley, "Once the zero length file has been created, the erase macro will be able to finish and allow the suspended suite to continue."

Distracted operators mean restricted service

THE prime aim for operators must be to run the system with a view to maximising throughput, thus providing the best possible service for the user.

For that purpose they should be left to work without unnecessary interruptions from outsiders.

But at certain installations, the operators meet with an almost endless stream of distractions. This tends to create an atmosphere of ill-feeling and makes their task extremely difficult.

The operations manager must protect his staff in this regard. If he does not do his duty, they must confront him and give vent to the discontent.

At one site I know of, the operators took this action and the manager agreed that users should not be allowed to enter the computer room and interfere with their work.

But after two weeks or so the manager, apparently suffering from amnesia, reverted to his old ways and, once again, users were allowed to go into the area and request that the operators give priority to their work.

At one stage it became almost farcical, for the manager of the stock control department would go into the computer room and tell the operators how many printers were to be dedicated to his work.

In the end, one of the operators took this particular user aside and expressed his thoughts on the matter at some length. The user complained to the operations manager who, in turn, complained to the operator concerned and thereby lost all credibility.

As far as I know, matters are now better at that site for they have a new operations manager.

At a second site I know of, the operators were, and probably still are, pestered by telephone calls relating to the work. The site provides an online system which is the responsibility of a TP section, residing in the computer room.

On one occasion, lunch-time in fact, the TP section was unmanned and so the main console operator had to deal with any calls from users experiencing problems.

If a user's line or terminal went "dead" the recovery procedure was this: use the appropriate command to get the terminal functioning. If that is unsuccessful, check out the control unit. If the terminal is still out of service, get the engineer to go to the user's premises.

One of the operators followed this procedure in response to a cry for help from one of the users. He had no success with the first two steps and so had to contact an engineer.

Ten minutes later the telephone in the TP area rang again; it was the same person, complaining that the engineer had not yet arrived at his site.

The operator again explained the situation to him, stressing that the engineer was on his way. Still not satisfied with what he had been told the user called twice more and a heated exchange took place.

The site manager became involved and the operator, who by this time was in no mood for the ear-bashing he received, told the manager just what he and the user could do with the malfunctioning terminal.

Now some might consider the operator's attitude to be wrong in this case. Perhaps it was. But the real issue is this: each time he answered the telephone he was taken away from the main console, so that the workflow was considerably reduced.

Guided tours of the computer room for groups of managers and other staff are another source of annoyance for operators. At a certain installation these take place with monotonous regularity.

On such occasions, the visitors want to see action, and plenty of it. So the printer area is always very popular; they crowd around the units, getting in the way of the operators, and always insist upon the printer lids being raised so that they can get a better view of the output being produced.

Almost inevitably, their guide is someone who knows little of the workings of operations. Nevertheless, he will pass some remark about poor stationery alignment and will attempt to display his manual dexterity by manipulating the controls, often with disastrous results.

The operator at the main console will also come in for a great deal of attention. The guide will probably request that he displays the job queues and active tasks, and the troupe asks a lot of questions, largely irrelevant.

I am not against this sort of ritual just for the sake of it. I object because it tends to obstruct the operators as they go about their work, and the visitors learn very little from the tour, anyway.

If an outsider wishes to learn something about operations, the manager should arrange for one of the operators to show him both the system and the department as a whole. This, of course, should be done when the staff are least busy.

Similarly, I have no objection to a programmer working in the computer room when on overtime, for this might save him going to and from the area. (However, I would suggest that he be kept away from the peripherals as I remember more than one well-meaning non-operations person causing a card jam on a reader.)

And my views are the same in relation to weekend overtime, particularly if it involves the development of a new application. In this case, the concession is beneficial to both parties; the operators learn about the application by talking to the programmers, and the programmers get to see how it actually performs on the system.

Messages from IBM OS to you

IN past Op Spots I have given an overview of the IBM OS operating system and discussed the main storage, or "core fragmentation," problem which sometimes occurs in the system.

I would now like to consider the messages used by IBM OS in order to convey a wide range of information to the operator. There are five types.

Action messages. These tell the operator that direct action is needed from him in order to cater for the needs of a job, or task, in the system. For example, the following message informs him that volume 123456 is to be MOUNTED on unit 120.

```
*IEF233A M 120, 123456, Jobname, Stepname
```

Eventual Action messages. These inform the operator that he is required to carry out one function or another, but need not do so immediately. For example, the following tells him that he may remove volume 654321 from unit 110.

```
*IEC111E D 110, 654321
```

Information messages. These keep the operator up to date concerning, for example, the stage of processing reached by a job in the system. The following tells him that a job called ABCRUN has been taken from the input queue and started at 10.30 am.

```
IEF403I ABCRUN, Job Started, Time = 10.30.00
```

Wait messages. When one of these is displayed it means that the entire system is at a standstill. The following informs him that a severe hardware error has occurred and that he must re-load the system.

```
IFB06W Machine error. Re-load OS/360
```

Decision messages. These are issued when it is necessary for the operator to use his experience in order to overcome problems, such as I/O errors. For example, if a tape unit is unable to read a volume, the following Decision message, along with certain closely-related Information messages, gives him the opportunity to SWAP it to an alternative device to see if that is able to perform the function.

```
nnIGF500D REPLY device or no
```

Assuming the operator wishes to try another device, he responds by typing R nn, xxx, where nn is the number of the message and xxx the unit to be used.

Racal chief demands electronics shake-up

A CALL from managing director Ernie Harrison for institutional fund managers to shake up management of electronic companies in which they hold shares and a strong hint that Racal Data Communications is planning to enter the automated office market, were highlights of the annual Racal Electronics Presentation in the City last week.

D. Leighton-Davies, Racal board member and head of Racal Data Communications, was one of the featured speakers and stressed the growing importance of data handling to Racal.

Racal Data Communications, which takes in Racal-Milgo, Racal-Vadic, and Racal-ESL, now accounts for almost 30% of company turnover, and the two US acquisitions, Milgo and Vadic, are performing particularly well. Milgo sales this year will be between $70 and $80 million, almost double what they were when Racal acquired the company early in 1977, while Vadic targets $10-£20 million this year compared with $12 million last year.

Having hitherto specialised in what goes between the mainframe and the terminal, Racal is expanding to encompass the terminal products as well. Racal-Milgo's System 400 and System 4000 cluster terminals account for 10% of US sales and will be launched in Europe next year, while newly-acquired Racal-ESL has developed a small transaction terminal with an LED strip display which is being tested in organisations like W. H. Smith, Sainsburys and the Territorial Army.

"Racal-ESL provides us with the germ of an entry into record communications, encompassing low-speed telex and office automation," said Leighton-Davies, and hinted at forthcoming products in the word-processing market and ultimately digital speech transmission.

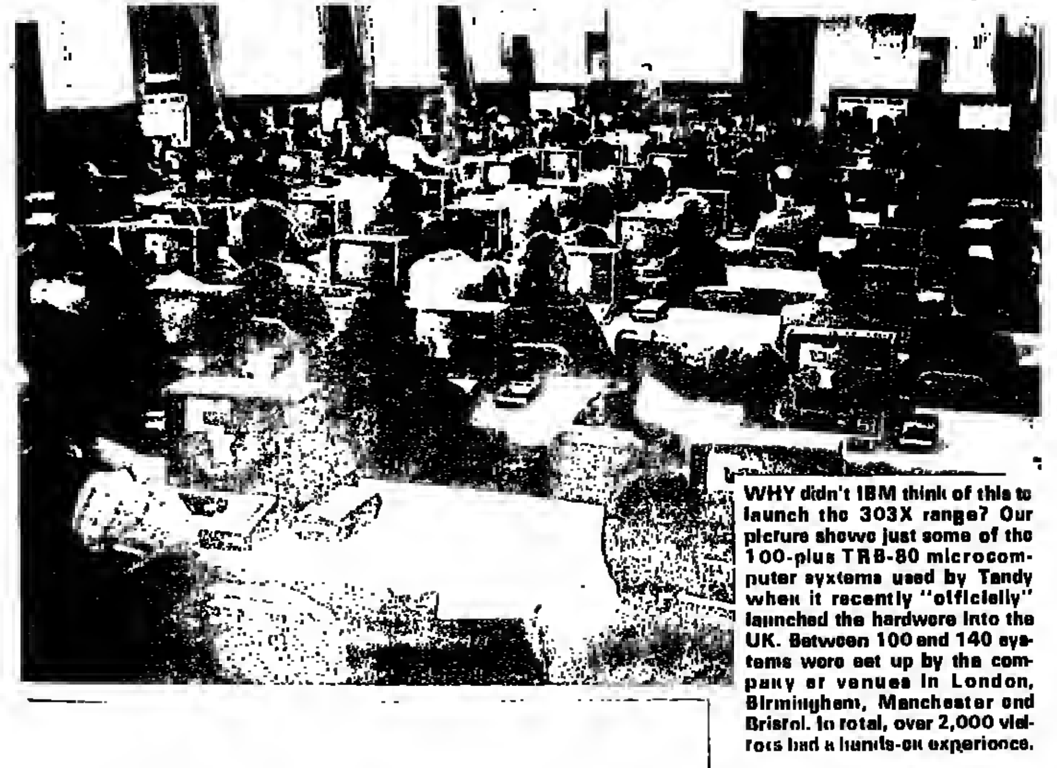
Reviewing the company's performance as a whole, Harrison noted that the declared aim of conquering the American market had been achieved, with annual sales of $100 million now, compared with $2 million two years ago. Europe, however, remained a problem.

On the subject of rationalisation of the electronics industry, he was more outspoken than ever. He exhorted the fund managers present to bring pressure on companies in which they had shares like Decca and Plessey to take part in a grand reorganisation, and once again put himself and Racal group management forward as the catalyst.

"People ask us where we would find the management to run a company like Plessey," he said. "But these companies are full of good management. All they need is leadership.

"Rationalisation is now being freely discussed: people are beginning to realise that the UK electronics industry is not very exciting, apart from GEC-Marconi and Racal. We have to compete with the rest of the world: we cannot afford to have teams developing the same product in different British companies," he said.

"Are there any companies in the field too big for Racal to acquire?" he was asked, and he responded with an immediate "no". On reflection, however, he conceded that GEC might be too big for Racal to swallow.



WHY didn't IBM think of this to launch the 303X range? Our picture shows just some of the 100-plus TRS-80 microcomputer systems used by Tandy when it recently "officially" launched the hardware into the UK. Between 100 and 140 systems were set up by the company at venues in London, Birmingham, Manchester and Bristol. In total, over 2,000 visitors had a hands-on experience.

Tyrrell team uses micros on race car

DEVELOPMENT work that could be of fundamental importance to the long-term safety of the motor car is currently being undertaken in the name of Grand Prix motor racing by the Tyrrell racing team's research and development division. Headed by an American applied mathematician, Dr Karl Kempf, the division is using microprocessors to help measure the total performance of the car on the track.

Similar to work started earlier this year by the Arrows racing team, in collaboration with Scicon (CW, July 13), the current programme is in fact the culmination of over two years' development work, according to Dr Kempf.

Transducers on the car convert displacements, velocities or acceleration, corresponding to the movement of the whole car, and sections of it such as suspension units, into voltages that are recorded on a specially designed cassette tape recorder.

Controlled by a Motorola 6802 micro, this can handle both digital and analogue data simultaneously. The data from the tape, after completion of a test run, is then read into a Hewlett Packard 9825 calculator for processing.

The processed data gives the car's design team a detailed assessment of its behaviour at all points during a test run, the object being to remove inconsistencies in its performance on the track, not only in terms of brute speed, but also in such vital areas as cornering and roadholding performance. Removing these, in theory at least, makes the car "quicker".

Dr Kempf is aware of the potential of his work, especially for the safety of the average family car. He certainly feels that this is a more important aspect of using micros in cars than providing in-car secondary information services, such as "trip" computers.

It is also significant that he is aware of the theoretical potential, in car safety terms, of closing the loop on using a micro in a vehicle. There is tremendous potential for using the micro for the real time control of certain actions of the car.

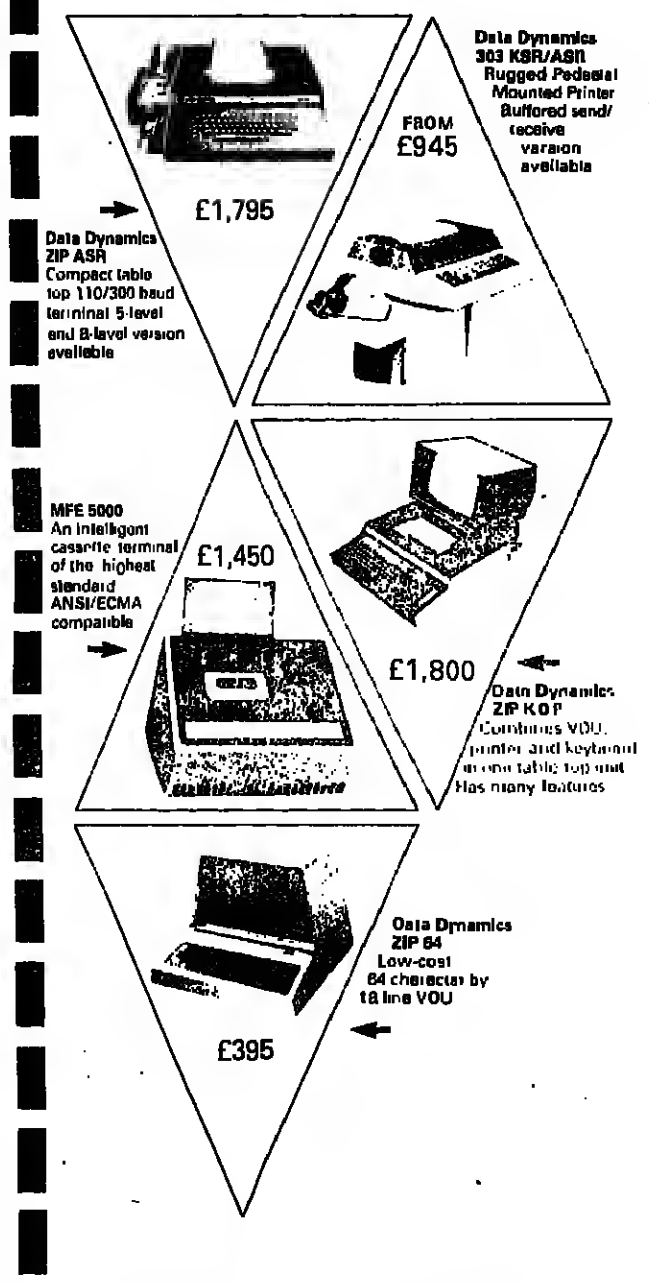
For example, in an ideal situation, the spring rates of the suspension would change for cornering from settings required for motorway cruising.

Dr Kempf encapsulated his feelings on this by saying, "It's all very well spending money on secondary protection systems like crash barriers for when cars have accidents. What we need to do is try and stop it crashing in the first place, regardless of the idiot driving it."

The development work with Tyrrell is being supported by Motorola and Cramer Microsystems, a Motorola distributor in the UK.

Maintenance agreement

COMART, the UK agents for US microcomputer manufacturers Cromemco, North Star Processor Technology and Dynabyte, has reached an agreement with Computer Field Maintenance for the exclusive provision of nationwide field maintenance on products from these suppliers. Regional service centres in London and Manchester are to be established in the New Year, followed by centres in Glasgow and Nottingham.



PEOPLE AND EVENTS

Edited by Nancy Pocock

Wilkes

Another honorary degree for Wilkes

AN honorary doctorate is to be awarded to Maurice Wilkes by the Technical University of Munich, for his pioneering work in the field of computer technology.

Wilkes is professor of computer technology and head of the computer laboratory at Cambridge, where he studied pure and applied mathematics and did his doctoral thesis in radio physics at the Cavendish.

After working in radar and operational research during the war, he returned to Cambridge to take charge of what is now the computer laboratory, and May 1949 saw the launching of Edsac 1, for which he was responsible.

In 1957 he became the first president of the BCS, and has since held many positions of responsibility in the computer field. He was one of a group of consultants recruited by Unesco to organise the first international conference on information processing in 1959, and until 1963 was the British representative on the council of the International Federation of Information Processing, which he helped to found.

Wilkes was the European member of the ACM councils from 1959 to 1960, became a Fellow of the Royal Society in 1958, and in 1968 received the Harry Goode Memorial Award of the American Federation of Information Processing Society of Japan, and a foreign honorary member of the American Academy of Arts and Sciences.

In addition to these achievements, he holds honorary degrees from the universities of Newcastle, Hull, Kent, City university (London) and Linköping, and has been chairman of the East-Anglian sub-centre of the Institution of Electrical Engineers, and a member of the council of the Institution.

He has also written several books and papers on computing, including the first book on computer programming in 1951.

Anthony Pritchard has been appointed a member of the BEAMA Publicity advisory committee. Publicity manager of Permali Gloucester, he will represent the Electrical and Electronic Insulation Association on the committee.

Derek Bier has joined Zygal Dynamics as area sales executive, covering the North of London and the Northern home counties. He joins Zygal from Univac, where he was a site planning engineer.

Brian Maurice has joined Control Data as regional manager, professional services. He was formerly systems development manager with BOC Datasolve.

Frank Hooper, formerly head of development at Barclays Bank's management services department, has been appointed a general manager's assistant.

Mika Collies, until recently a systems and programming consultant with CMG (City of London), has been appointed an associate director of the company.

Advice on courses of study was dispensed by Middlesex Polytechnic DECsystem 10 at the Careers 79 exhibition at Alexandra Palace. Terminals at the exhibition transmitted inquiries via a PO telephone link to the system at Hendon.

The programs used were developed for the polytechnic's Higher Education Advisory Centre, which keeps information on all courses at polytechnics and colleges in Britain and which offers a special service to prospective students during the summer in co-operation with The Observer.

Redifon Midlands

THE Midlands office of Redifon Computers has moved from its premises at Lutterworth, Leics, to Belmont House, Vicarage Road, Edgbaston, Birmingham. The telephone number is 021-454 5295.

Manager is **Neil Green**, and the branch comes under Redifon's Northern region, managed by **George Snelgrove**.

Alfie Best, previously a Computer Technology regional support engineer for the Midlands, has joined Four-Phase Systems as field engineer, also in the Midlands region.

Malcolm Proul, a senior consultant analyst with RHM Computing, has moved from the development division to the marketing division.

Kenneth Jeffs has been appointed to the position of managing director of Atlantic Computer Engineering, the newly formed engineering subsidiary of the Atlantic Group. He was previously a senior technical manager with ICL. **Leonard Ford**, formerly a senior technical specialist with Memorex, becomes engineering director. Atlantic Computer Engineering is based at the group's engineering centre near Slough.

Jeffs

Reindorp

Peter Reindorp has been appointed operations manager with the European digital systems division of Texas Instruments. He was previously manager of administration support with the company's digital systems group in Houston, Texas. **Les Barr**, formerly financial accountant with Bestobell Insulation Ltd of Glasgow, becomes controller of the division, with responsibility for financial control.

Michael Tall has joined Hallmark Computers as sales manager. He was previously stock control manager at Tesco. **Rick Jones** has been appointed systems development manager, after working for Computer Ancillaries as an engineer and software support specialist.

Bob Gascoit has been appointed as an engineer with Erlebach Engineering. He was formerly ADV Tornado software manager at Marconi Avionics. **Richard West**, previously a design engineer with British Aerospace, also joins Erlebach as an engineer.

John Fowling, previously airline marketing manager with Univac's International division, has become assistant DP manager, systems, with London Transport.

Clive Waite, previously a sales executive with Memorex, has joined Documation as a sales engineer. **Douglas Hay** also becomes a sales engineer, after working for Systime as a sales executive. **Tom Cooper**, formerly company secretary of Hatton, is appointed to the post of manager of finance and administration, while **Erwin Kaiser** becomes manager of European customer support. He was previously Swiss administrator for the company.

Frank Knight, a former salesman, has been promoted to sales chief with Dane Systemset. He will have overall responsibility for new business and customer maintenance. **William Dixon**, previously a salesman with Computaprint, has joined Systemset as sales executive.

Lawrie Collins has been promoted from field operations manager with Systime to divisional director of software operations with the company. **Jim Gee** becomes divisional director of manufacturing, having formerly been production manager. **John Arnold**, previously OEM sales manager, is appointed to the position of divisional director of OEM sales.

Sandy Blackie has been appointed manager of the Scottish development centre of ICL, based at Dalkeith, Midlothian. He was previously software distribution manager for the company.

Blackie

Thompson

Derek Thompson has become director of European operations for National Semiconductor's computer products group. He was formerly managing director of Infotex.

David Braybrooke has joined Systime as distributor sales manager. Prior to this, he was distributor sales manager for Europe, Africa and the Middle East for an American minicomputer manufacturer.

Christopher Barling is one of five graduates who have been recruited by BIS, to undergo further training and to assist senior staff in the development and implementation of systems. He was formerly engaged in software training with East Midlands Gas. **Paul Berry**, previously a programmer with Ranade, also joins BIS, as does **John Fox**, who is a former systems analyst/programmer with Esso.

The other recently recruited graduates are **Donal Ryan**, previously a customer support executive for Comshare, and **Kevin Sayer**, until recently an analyst for Allied Breweries.

Soccer

NEXT year's Manchester Five-a-side Knockout Cup — a soccer tournament for computer people in the Manchester area — will begin in late January or early February. It is to be organised by Altrincham-based software house Quadrant Computer Services, the cup-holders.

For further details contact Roy Knowles, Quadrant Computer Services, Ashley House, Ashley Road, Altrincham WA14 2BR.

DIARY

DECEMBER 18

Standard buses for microprocessors. Microprocessor Application Group IEE, Savoy Place, London WC2. 14.00.

DECEMBER 19

Quadrophonics. Dr K. Barker. IEE, Savoy Place, London WC2. 14.30. By ticket only. To be repeated on December 20.

Visit and talk/The work of the control engineering division. BCS Processor Control Group. Warren Spring Laboratory, Stevenage, Herts. 11.00. Tickets from P. K. Andow, University of Loughborough, before December 18.

Data Structures. BCS Formal Aspects of Computing Science Group/Software Engineering Group. Birkbeck College, London WC1. 10.30.

JANUARY 1

National police computer system or the police command and control system IDPM. W of London to Oxford branch. Bull Hotel, Gerrards Cross. 20.00.

JANUARY 4

The application of microprocessor-based systems by engineers. IMechE/IEE Microprocessor Application Group. University of Leeds.

JANUARY 6

BCS 79 Open Day. BCS Harlow sub-branch. Coaches provided.

JANUARY 9

Packet switching, an overview. T. W. Adam, J. O. Wedlake. IEE, Savoy Place, London WC2. 17.00.

Computers in retail distribution. J. E. Blake. BCS Croydon branch. Fairfield Halls, Croydon. 19.15.

Computer fraud, lose control and lose you money. J. M. Ross. BCS, Reading branch. Copper Inn, Pangbourne. 20.00.

JANUARY 10

Meeting. Cumac. CMC Users' Association. Gateway House Hotel, Cardiff. 10.30.

JANUARY 11

Teaching laboratories for microprocessors. Microprocessor Application Group. IEE, Savoy Place, London WC2. 14.00.

Industrial robots for materials handling. BCS Merseyside branch/Institute for Measurement and Control. Liverpool Crest Motel, Knowsley. 19.30.

Distributed processing. D. B. Cohen. BCS S Yorks branch. Hallam Tower Hotel, Sheffield. 19.30.

Chance for EMI to step up trade with Japan

EUROPEAN companies, including EMI in the UK, have an opportunity to increase imports of electronic medical aids to Japan. The Japanese government is planning to increase expenditure on electronic medical equipment to include about £43 million in fiscal 1978 classed as "emergency imports."

This is part of a £2 billion programme aimed at reducing Japan's balance of payments surplus.

Total Japanese sales of electronic medical equipment this year are already estimated at about £245 million.

The Ministry of Health and Welfare has been allocated about £26 million of the additional amount, and the Education Ministry will get about £8 million.

European manufacturers of electronic medical products, among them EMI, Siemens and Philips, are joining in the fierce competition for orders.

But the emergency imports programme is the result of US pressure on the Japanese government to even up the balance of trade between Japan and the US, and there are rumours that the government has given administrative guidance to universities and hospitals to buy only US-made equipment.

These rumours are denied by the Ministry of Health and Welfare.

International interest in highway design system

INTERNATIONAL interest is being shown in a computer-based highway design system developed by a consortium of three UK local authorities.

The system, called Moss — for Modelling Systems — was developed by Northamptonshire, West Sussex and Durham County Councils, and has been recently sold to the Dutch government for £25,000. Talks are now taking place with a CDC bureau in Australia and the Hong Kong government, and it is already in use by the Ove Arup company in Riyadh.

In the UK, many local authorities have adopted the system for their own highway design needs and the three joint developers have earned about £10,000 each so far.

ICL woos—and warns—services firms

ICL is to offer more favourable OEM terms to system builders as part of its policy of seeking more co-operation with computer services companies.

At the same time, ICL managing director Dr Chris Wilson warned a meeting of the Computing Services Association last week that he also believed there would be increasing competition between ICL itself and CSA members as the company achieved his aim of making ICL a total service company (CW, January 12).

Dr Wilson also stressed that he disagreed with those who claimed that ICL's own software subsidiary, Dataskil, enjoyed an unfair advantage over other companies when bidding for business from ICL users.

Reinforcing his point about Dataskil, Dr Wilson told the CSA. "I would never support such unfair trading practices."

He quoted two examples of co-operative ventures with outside companies — the London Airport Cargo EDP Scheme, LACES, where ICL worked with Computer Sciences, and the European Space Agency Meteosat project, where ICL was involved with several other companies.

Dataskil is a CSA member but Dr Wilson told other CSA companies that ICL would welcome their developing software for ICL systems and that ICL would be delighted to buy it.

He added that ICL was also changing its policy to computer service companies that it supplied on an OEM basis, and intended to offer them better terms.

While sweetening the pill with these assurances, Dr Wilson pointed out that the increasing importance of software in adding value to systems meant that ICL would be more in competition with CSA members in the future.

Ending on a conciliatory note, he said, "Collectively ICL and CSA have an enormous responsibility to British industry. I am sure that the whole can be better than the sum of the parts."

DR WILSON . . . "I would never support such unfair trading practices."

Plessey order book stands at record £765 million

PRESENTING Plessey's second quarter results, group finance director Peter Marshall said that growth had been particularly strong in telecommunications private systems. New equipment, the Private Digital Xchange, had been introduced early in the year (CW, February 23) and deliveries would be mainly in the second half-year.

On the PTT side, he said, there had been a slow order intake nine months ago, particularly from the UK Post Office, but TXE4 exchanges would be delivered in substantial quantities in the second half year.

The strength of the order book was a feature of the results, Marshall said, and at a record £765 million it was 25 per cent up on last year's second quarter.

Pre-tax profits in the second quarter were £10.7 million, compared with £9.8 million in the corresponding period last year.

Asked about Plessey's involvement in talks on restructuring the telecommunications industry, Marshall said, "We are talking to all parties who have a contribution to make to this debate, but we have not yet crystallised our position."

NEWS IN BRIEF

Tandem profit up 1,000%

DEMONSTRATING that a genuinely new idea and a phenomenal growth rate go hand-in-hand, Tandem Computers, which specialises in fail-safe multiprocessor minicomputer systems, has reported profits up over 1,000% at $2.1 million on turnover up 216% at $24.3 million for the year to September 1978.

In the fourth quarter of the company's financial year, turnover at $8.4 million was up 173% over the same period in 1977.

During the year, the company shipped 176 processors to 68 customers. The previous, first year of operation saw shipments of 81 processors.

Concorde cleared

CONCORDES operated by both British Airways and Air France have had their automatic flight control systems approved for automatic landings in fog down to Category III weather conditions. This means that the control system, developed jointly by Marconi Avionics and SFENA of France can now land in conditions where the minimum visibility is about 200 metres.

HP sales up 27%

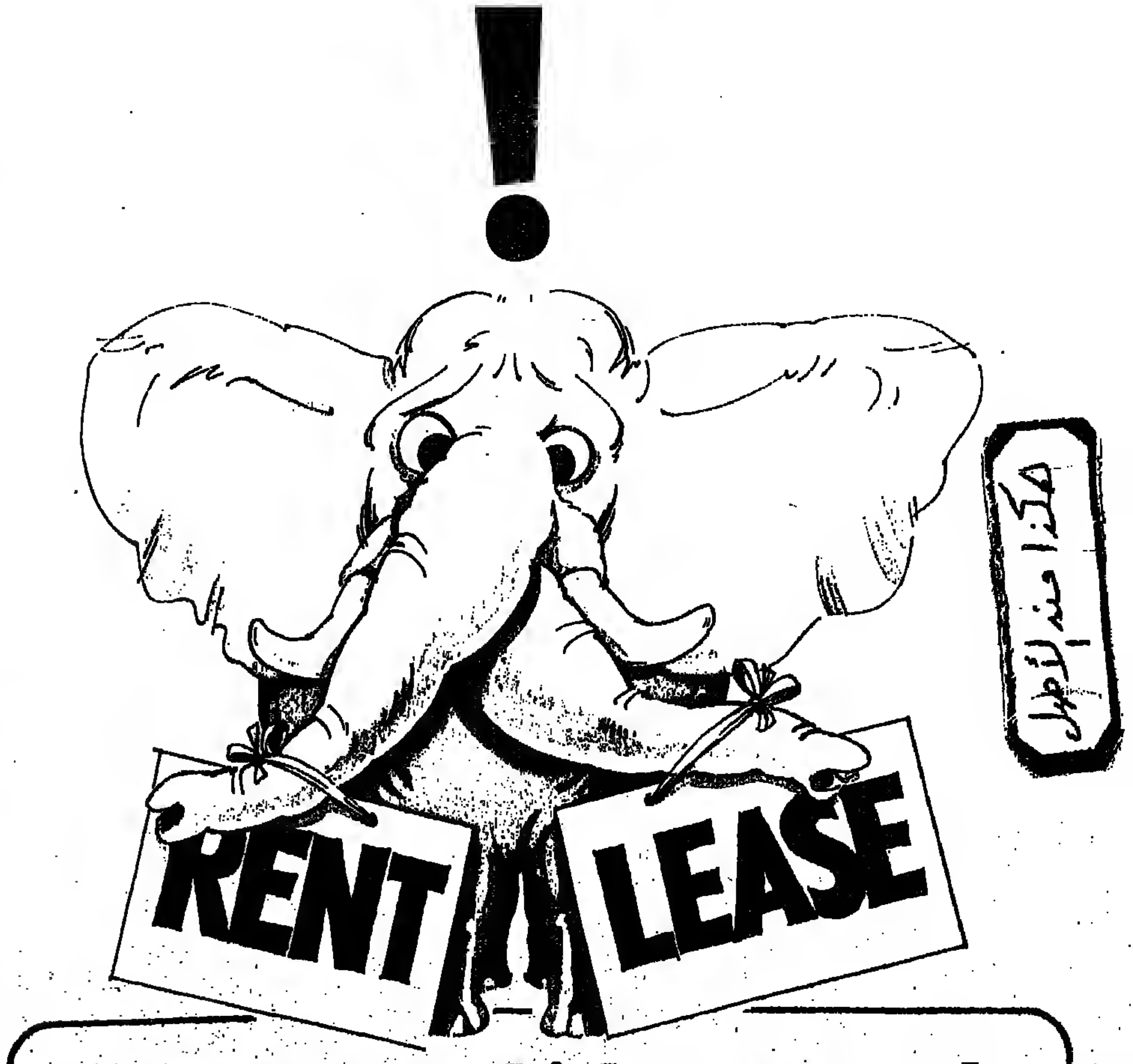
A SUBSTANTIAL growth in both sales and net profits has been reported by Hewlett-Packard in the figures for its last financial year which ended on October 31. Sales increased by 27% on the previous year to $1.73 billion, while net profits rose by 20% to $153 million.

Installation

AS a major enhancement to its IBM-based services, the Data Services Division of Control Data is installing a four Megabyte IBM 3031 next April at its centre at East Barnet, Herts, where it will supplement an existing IBM 360/65.

For 1500 users

SALES, purchase and nominal ledger packages developed for ICL 1500 systems by Computer Facilities Software Ltd of Cleckheaton, Yorkshire, are now being offered by ICL to 1500 users. Till now the packages have been supplied directly to 1500 users by Computer Facilities.



COMPEC 78

Reports by Tim Palmer and Martin Banks

A general view of Olympia's National Hall at Compec.

Biggest and best UK computer show

BY THE TIME Compec 78 closed its doors, twice as many visitors had passed through the turnstiles as last year. And in business potential, entertainment value and sheer enthusiasm Compec could justifiably claim the title of most successful UK computer exhibition yet. Sponsored by Computer Weekly, Compec 78 was held at Olympia's National Hall, imaginatively converted into a blue-carpeted computer palace.

Boom time

IT will take months for companies to sift through the leads picked up at the show, but all the signs are that Compec 78 laid the foundation of a computer boom in 1979.

Those who predicted doom if the show were to move from Wembley were confounded by the turnout of visitors, and even the National Hall was scarcely big enough to allow visitors to pass easily between the packed stands. Many of the exhibitors would have been glad of double the space.

An enormous amount of serious business was done, and visitors often had to wait 10 minutes for attention on the more popular stands — but there was much more than ever before to divert them while they waited.

For long a feature of US computer exhibitions, showbiz razzamatazz in Europe has hitherto been confined to the sterling efforts of John McNully, of Modular Technology, to make us laugh. But at Compec 78 his Buztys, pneumatic young ladies bearing a striking resemblance to the Post Office's relentlessly chirpy mascot, had to compete for attention with a score of other attractions ranging from a boxing kangaroo and Miss Australia (courtesy of Telecomputing), to a pearly-costumed Arthur Mullard engaged for the occasion by Computrade.

On the product front it gets harder and harder to spring surprises, because everyone expects everything to be 10% faster, 10% cheaper and 10% smaller than last year.

Noteworthy newcomers to the show included GEC Computers, at last chasing after the commercial business systems market; Tandem Computers, inviting people to "pull the plug" on their Non-Stop 16 system; and Sycor consummating its marriage to Data 100 within the Northern Telecom camp by exhibiting on a joint stand.

Despite the competition from pearly kings and prize-givers like Nashua (Champagne) and Livingston Hire (a Commodore Pet), Modular Technology still managed to provide Compec's major highlight, but this year more through a product than a gimmick. This was an all-new rock-bottom cost voice-response system which even managed a featured spot on BBC Radio Four's Today programme.

The profile of visitors has changed significantly and the once mainly OEM show now attracts a majority of end-users looking for systems and add-ons.

Arguments will continue for weeks over whether children should be admitted. Some say it is a hazard of exhibiting at Olympia; others that one eminent exhibitor should have known better than to send out invitations to schools. As the show grows, as the mass media devotes more and more space to computers and microelectronics, it is inevitable that an increasing number of visitors will be lay people just waiting to discover what it is all about.

Cheque for £590 on first day

A CHEQUE in the hand is worth two in the post, as any businessman will tell you, and Henry Lewis was delighted to receive a cheque for £590 on the first day of Compec. The writer of the cheque was Osborne House, of software specialists O & J House, and in exchange he took away an Oki CP 110-matrix printer for evaluation with a small business system with a target price of £2,500.

Henry Lewis was enthusiastic about response from visitors: 700 called at the stand, 300 promising contacts were made, and he says that if only 10% of these come up with reasonable orders, Compec 78 should be worth £500,000 to his company.

● Another company cheering about business done at Compec was Datapod, with a £200,000 order for more than 100 Datapod 2000 point-of-sale terminals from its Benelux distributor.

Miss Australia in a clinch

Denise Coward, the reigning Miss Australia, fetchingly attired in electric blue shorts, goes into a clinch with Fred, wearing the latest in boxing gloves, while Michael Rukorta, managing director of Australian-based Electronic Control Systems Pty rues the day when he agreed to referee this decidedly unequal contest.

The three Antipodeans were to be found, naturally enough, not a stone's throw from London's world-famous Kangaroo Valley, on the Telecomputing stand at Compec.

Purpose of the manifestation was to underline the attractions of the ECS 4500 high-performance floppy-disc backed intelligent display terminal, which is marketed in the UK by Telecomputing.

Israel's best-known computer company, Elbit, made its UK exhibition debut at Compec with the Poct small business system, which is based on an Israeli-built LSI version of the Control Data Cyber 17 mini.

Pictures by Bill Banks

Driving power

IT takes a considerable amount of electronics to drive the world's fastest impact printer, as this picture shows. The DOC 3000 3,000 lpm line printer appeared on the Documation stand, is IBM compatible, and is attractively priced as a back-up printer for the ultra-fast laser printer like the IBM 3800.

Arfur's message

Buy British is the message from the Computrade marketing company, so it was no coincidence that British frew and frew Arfur Mullard (left), was enlisted to brighten everybody's Compec day in Pearly costume.

Born again

One of a whole band of born-again British minimakers exhibiting at Compec, Digico styled itself "Another Great Briton," and managing director Barry Mallor was on hand (below) to tell the company's recent success story. Since reorganising two years ago to go all out for the OEM market, Digico sales have more than doubled to £2.5 million with £250,000 pre-tax profit in the year to September, and the company targets 99% growth to £4.6 million this year.

Honeymoon couple

THE only couple actually to spend their honeymoon at Compec were Stuart Bagshaw, regional sales manager with Systems Industries (Europe), and his wife Leslie, who tied the knot on the Saturday before the show.

Business was so brisk at Compec that Stuart had to pitch in with the rest of the Systems Industries team, and Leslie also lent a hand, even though she is not employed by the firm. We understand that they are now enjoying a well deserved holiday.

Main attraction on the SI stand was the 180 cps Siliconics Quietype ink jet matrix printer — a much faster alternative to serial thermal printers.

COMPEC MICRO NEWS

It's the little things that count

"I WISH they could automate people instead of computers" was one passing remark during the hectic three days of Compec and it somehow summed up the show in its new home at Olympia. More people than ever turned up to see what was on show in a year when microelectronics and computing have become fashionable — and a year when the technology is beginning to show some real fruits of development.

Systems based on the use of microcomputers were everywhere, and there were more actual microcomputer systems than ever to be seen. There were also some novel examples of how the use of microelectronic technology can alter radically the accepted "norms" of computing and data processing hardware.

Favourite

AN application area that is becoming a growing favourite for small systems, word processing, was well represented. Comart, for example, had two versions on display that run on Sol hardware. One, the Sol Star, runs on a Sol 20/10 with a dual disc floppy. Costing £2,800, less a printer, it provides corrections, additions, deletions and text movement.

Wordwizzard runs on a Sol-3 and costs £5,000, less a printer.

For example, at last year's Compec, though there were many video terminals on show, there was none for sale at under £300. Twice that figure, yes. This year there was one. Coming from the Newbear Computing Store, and on show on the stand of parent company Newbury Laboratories, the model 700 terminal featured a 12 inch display and a separate Hi-Tek keyboard, offering 64 characters of 16 lines of upper case ASCII for £29[illegible]. One of the key ways in which the price has been kept down, according to Newbear's Tim Moore, has been the use of the "cheapest display system around, a portable black and white TV with the IF strip taken out". Using the same Thomson CRT controller chip that the company uses in its Pettevid video control board, the terminal is currently on six to eight weeks delivery.

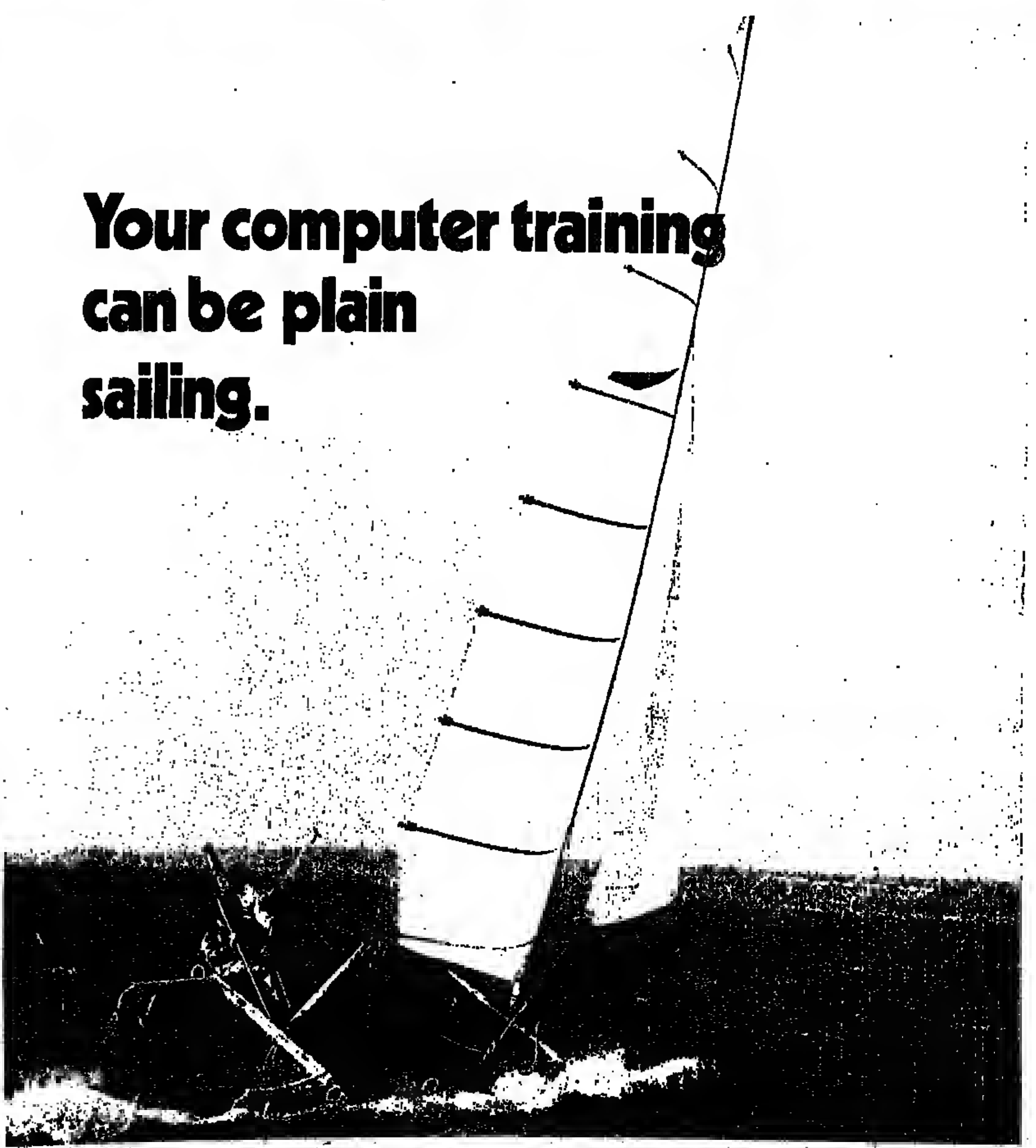
Now going for business entirely in the business and professional market, Compelec backed up its existing range of Altair microcomputer systems with a display of a brand system, the Compelec Series I.

Managing director Rol Vershuys said that about 50 of the systems had been sold since its introduction just before the show. The Series I, in fact a US made Altos for which Compelec has exclusive UK distributor rights, is a Z80 based set-up with 64 K bytes of RAM, 1 K byte of EPROM, two parallel and two serial ports and a hardware floating point processor. Disc storage is selectable between 500 K bytes and 4 M bytes. The software for the system includes the CP/M operating system, together with Cobol, Basic Fortran IV and Pascal.

The entry earlier this year of the Consumer Division of ITT into the personal computer business, with the taking of marketing rights on the Apple II computer, brought the Division to Compec as an exhibitor. Now known as the ITT 2020 microcomputer, the system is still very much an Apple, even though the case is now painted silver. In fact, the 2020 is still a genuine Apple, imported from the US.

ITT has plans to start manufacturing the system at Basildon, but this is unlikely to start until next February. The company has, however, decided where its best market opportunity lies, for it is currently developing a range of business oriented applications software packages.

With ease of application becoming as important as the computational capabilities of microcomputers, there were several specialist software and systems houses at the show. One, Micro Focus, was demonstrating a new utility for its CIS Cobol software package. Known as Forms, this is aimed at reducing applications programming time by removing the need to write data input and output descriptions. This is achieved by creating a file of record descriptions that can be copied into the program when required.



INPUT TECHNIQUES

How voice data entry achieves a high standard of recognition

This charming lass is demonstrating Recognition Equipment's 3400 Series portable OCR WAND. Data is recorded on a mini-cassette and it can also be input via the calculator-type keyboard. The 3400 has been on the market for about six months.

By John Saunders

ALMOST all science fiction writers expect computers to respond to spoken commands. In the Computer Weekly/Dataskil essay competition earlier this year, speech understanding computers were often the normal medium of communication; yet few computer professionals are aware that the voice recognition barrier has been broken.

Current devices are not as clever as Hal but, in addition to several low priced fun kits, there is a rapidly growing number of industrial installations doing a real job of work.

This article covers the state of the art in voice data entry. Currently some 300 voice systems are in use in nine different countries. The DP industry in the UK has been painfully slow in realising the potential, adopting it and thereby encouraging the investment necessary to produce advances in technology and more cost effective terminals.

Computer communication has been sadly neglected over the last two decades, possibly because the enormous advances in mainframe technology have claimed the majority of attention.

Key entry has always been understood and although not fully trusted, is universally used.

Because of the high cost, time delay and the possibility of errors being generated in the transcription process, many devices have been adopted to eliminate key entries' inherent weaknesses.

The tremendous costs associated with manual data entries are often spread over the user departments and accepted, albeit sometimes under protest, as a fact of life.

You will appreciate that if clean data can be collected at source, *the point of greatest intelligence*, not only will it eliminate corruption in transcription, it will eliminate the cost of that transcription and its time delays. If it can be verified at source, prior to capture, it must be more accurate. Then why don't we do this? Simply because it is not possible to do it.

Few of us are trained keyboard operators and if we were it would, in many operations, be inconvenient to use a keyboard. This is particularly so in factory based systems.

Where a specialist, be he a production worker, inspector, designer, despatcher, etc., requires to use his hands in his primary task, the peripheral activity of recording his findings must affect his productivity.

So the facility to bypass the transcription sequence, enter data while the hands are busy with other manual tasks and report information, must have real benefits.

Voice data entry (VDE) terminals are simply either dumb or intelligent terminals depending upon the type of model chosen. As a dumb terminal all it will do is recognise a pre-determined vocabulary, display the input for verification, convert it to the pre-determined coded output. For example, it could emulate a teletype and no more.

Alternatively, because these terminals use microprocessors they can be intelligent terminals, or with expanded memory become complete stand-alone systems.

Currently the majority of installations in use are under control of a minicomputer. Typically several voice terminals are interfaced to a host mini. The mini acts as controller receiving data from the terminals, performing local time-critical computer tasks, controlling management information reports and writing less time critical data to disc.

Of the three hundred systems in use, almost all are the product of one company. This device is called the Threshold 500 VDE terminal. As this is really the only VDE terminal in commercial use in any quantity, it would be practical to describe it.

The processor, about the size of a desk top office copier, acts as a speech translator. In conjunction with its built-in microprocessor it analyses and identifies words or phrases spoken into the system.

The Threshold 500 is an "isolated word" recognition terminal. That is, each utterance or vocabulary word must be followed by a short break of up to 0.1 seconds.

A vocabulary word may be a digit, a word in any language, a string of digits or a short phrase lasting no more than four seconds. The vocabulary normally consists of 0 to 9, control words and the normal data words. The size of the vocabulary is variable from 64 words minimum and can be expanded as required.

Since such hardware is usually dedicated to a particular application a requirement for a vocabulary greater than 192 words is unusual.

Each user initially trains the system to understand his particular pronunciation, therefore anyone can use a voice recognition system without requiring additional skills.

Accents, foreign languages, etc. pose no problems to this technology. Training involves repeating each of the chosen words or phrases 10 times. An average of these inputs is stored in memory. Any time an individual word may be "retrained" thereby eliminating any difficulties resulting from temporary illness, etc.

Once the machine is trained by each of the operators who are destined to use it, it is set to the recognition mode. In this mode, when the processor receives a pattern of a word, it searches the patterns stored in memory for the best match, and compares the bit count of the input with that of the nearest match in the memory.

This score is given a "threshold test" and the word is either chosen or a reject signal is transmitted to the user via a screen. By using the screen for visual verification one can ensure that the occasional error is discovered and corrected before the data is actioned.

Our voices alter during the passage of time so a facility to override the reference pattern of any selected word must be a feature of any such device. It takes less than 10 seconds to train each word. One can continually update the reference pattern to suit the demands of higher recognition accuracy, quickly, quietly, and with the minimum of interruption to one's work pattern.

A directional noise cancelling microphone is used to minimise outside interference. Tests show no loss of recognition in an ambient background noise of 56 dB; at 105 dB the performance dropped a little.

In these early days of voice recognition systems the areas of satisfactory application are rather limited. They fall into two major groups, data entry and machine control.

Typical beneficiaries of such systems are described below.

Grading lamb carcasses using voice input is operational in a New Zealand meat processing company. The system keeps track of every lamb until its carcass ends up weighed and graded on the hooks.

A Digital Equipment PDP-11 equipped with voice data entry is streamlining the grading procedures and making life easier for the employees who would normally have to record data with pencil and paper in a hostile environment.

By speaking into a microphone the grader has both hands free for his primary job. At the same time transcription errors are eliminated. The end product is more accurate and payments to the farmer made within minutes of the last carcass being graded. For the company the benefits are faster throughput of carcasses, greater accuracy and less clerical work.

Each mob, on arrival, is penned for its particular chain. Mob details are entered while the animals are in the stockyards and these details are displayed on a screen in front of the grader. As each carcass is graded details are stored and the display is updated in terms of the number graded in the present mob.

At any time the display shows: the number of lambs in the mob on the chain; the number of carcasses already inspected and graded in the mob and the number still to be checked; the number awaiting attention on the detain rail; a display of the grade information on the carcass currently being inspected. This enables the grader to verify visually that he has been correctly understood by the VDE.

Each grader has his own code number for operating the computer. Before starting work for the session he trains the system to understand how he speaks the words normally used in lamb grading. These reference patterns are stored in the computer which identifies the graders' pattern with his code number.

The grader inspects each carcass and grades it according to the fat cover and conformation. At the same time the electronic scale inputs the weight.

If more information is required from the grader, such as the reason for downgrading a carcass, the grade symbol is shown on the screen followed by a prompt to the grader. If this prompt is ignored the system will not proceed.

● Turn to page 15

As computer processing power becomes cheaper, it is even more important to improve input/output performance. In this two-page feature Computer Weekly looks at two significant recent developments on the input side, voice recognition and optical character reading. John Saunders of EMI takes a step beyond the voice threshold and, on this page, David Billman of Recognition Equipment, waves a magic wand.

What portable terminals are going to do for OCR

By David Billman

OPTICAL Character Recognition is nothing new. To those faced with the task of processing large volumes of turnaround documents, OCR techniques offer the only cost-effective solution for rapid data input.

Today billions of bits of paper are scanned daily — the ubiquitous Giro system being only one user.

Over the past 10 to 15 years, OCR has been mainly the system for the big user. Centralised mainframe systems, being fed with large volumes of documents and forms of all kinds, created the need for OCR readers and sorters capable of very rapid reading rates, in some cases over 2,000 forms or documents per minute. The situation has not changed all that much during this time, and such sophisticated devices still find a ready market. However, the age of the microprocessor may change all that.

The introduction in 1971 of the first hand-held OCR reader was the first indication of what was to come, though I think few people realised it.

True, over 50,000 OCR Wand readers are now in use in retail shops and stores throughout the world, and this figure is expected to grow extremely quickly in the next two to three years. Already, several large retailers in the UK have adopted OCR techniques for marking merchandise both for point-of-sale recording and back-office data capture from documents.

The use of online, in-store processors has already caused one major UK department store group to go over to OCR techniques completely in the areas of OCR-printed purchase orders, online tag and label production, merchandise receipt data capture, and other interesting applications.

But what about those other applications?

OCR Wand readers have evolved in their sophistication of reading and interfacing. The connection of OCR readers to key entry devices, VDUs, modems and minicomputers is now possible. This flexibility offers the user some very interesting solutions for the use of OCR techniques in the distributed data capture environment.

One of the more recent and exciting applications is the use of OCR Wand readers in libraries.

The OCR Wand is being used to read details of library books being issued and returned. OCR labels containing International Standard Book Numbers (ISBNs), the book copy number, etc are being printed via online printers from centralised files, to be read at the library counter. The Wand readers are connected to intelligent minicomputers which store and transmit the relevant data, while at the same time watching out for overdue volumes.

Another applications area considered to be a growth area for OCR techniques is the recording of payments of all kinds.

In the public utility field, OCR is already widely used for the processing of documents in a batch mode. However, a number of these utilities are seriously considering the automation of distributed payment points, like showrooms, regional payment offices, etc. Large numbers of the utility-using public still like to go and pay their bill personally. What better than to utilise the OCR details already on the bill to capture the payment details there and then?

OCR Wands are being used in cash and carry warehouses, both in the UK and Europe. Probably more OCR reading is being done in cash and carry warehouses in Germany than many people realise.

OCR Wands are being used in mail order companies to process picking slips following the despatch of the goods to the client, the process of order entry being used as the database for subsequent picking slip generation. It is often the case that the line printers used by these companies already produce in OCR-fount style.

Recently announced, the new fully portable OCR Wand terminal has finally made OCR competitive with other portable reader terminals. The obvious advantage to the retailer, in being able to use such a device for rapid stocktaking from existing OCR tags and labels, creates an initial market potential.

However, the unit's portability opens up a whole range of interesting OCR application ideas. It is already the case that several major multiple retailers have installed this device as a low-cost alternative to point-of-sale cash registers. Large numbers of these retailers still do not use cash registers, but do have sophisticated unit stock control systems.

The current interest in the use of OCR techniques has without doubt been prompted by the reliability of today's technology. Electronic reading techniques cannot fail to be improved by smaller and more sophisticated components. This must lead to more processing power being available to "hold in your hand", and maybe this is "what your right arm is really for".

High standard of recognition

● From page 14

The system has been designed to be failsafe and to verify all information on the spot. The high background noise in the plant has no adverse effects upon the accuracy. Neither do the problems of blood, steam, water and other hostile elements affect the performance of the graders.

Our second case touches all the bases of employer employee goals in a union shop, involving a tedious, expensive job function for which a worker is compensated on a piece-work basis. The example shows the ideal interface between blue collar worker and the most sophisticated of technologies.

The company manufactures compressors for the refrigeration and air conditioning industry. With more than 50,000 different products the company despatches 60,000 items per day and experiences a defect return of one and a half units per minute per day.

Each defective product must enter a credit system which used to involve the following employees: 1. a piece work inspector who had to identify the problem and enter much information, by hand, on to control sheets; 2. a keypuncher, to interpret often illegible writing, and enter the data for credit purposes; 3. a clerk to check the keypunched data against the original forms; and, 4. another employee to interpret all the information for credit purposes.

Under this system, the user was experiencing a faulty data rate of 30%, with the result that it averaged six to eight weeks to issue full credit for each returned part.

This system also produced tension between workers, who tended to blame each other for the problems which were actually a by product of a tedious data collection process.

Just when they were seriously considering an elimination of the entire credit system, which would have been costly to the company, and would have eliminated many jobs, officials tried voice data entry.

Now, the worker on piece work speaks his information directly into a terminal, cross-checks the data, and verifies the product number for proper credit immediately. The credit process, once six to eight weeks long, now takes three days.

The result of this conversion to voice data entry has been the elimination of six keypunchers and four data screening clerks. However, this move has been more than counterbalanced by the dramatically improved productivity, with piece workers now processing more units.

The fact that the dissension has been eliminated with the employees working under less inter-departmental tension, in addition to the retention of the credit system and its major job functions, has improved job satisfaction.

In an era when workers, union officials, management, government officials and consultants are increasingly concerned about the potential dominance of machine over Man, it is refreshing and, perhaps ironic, to discover that Man can still create better working conditions and improve productivity by assuming more intimate control over his machines through the most elementary form of communication — His Master's Voice.

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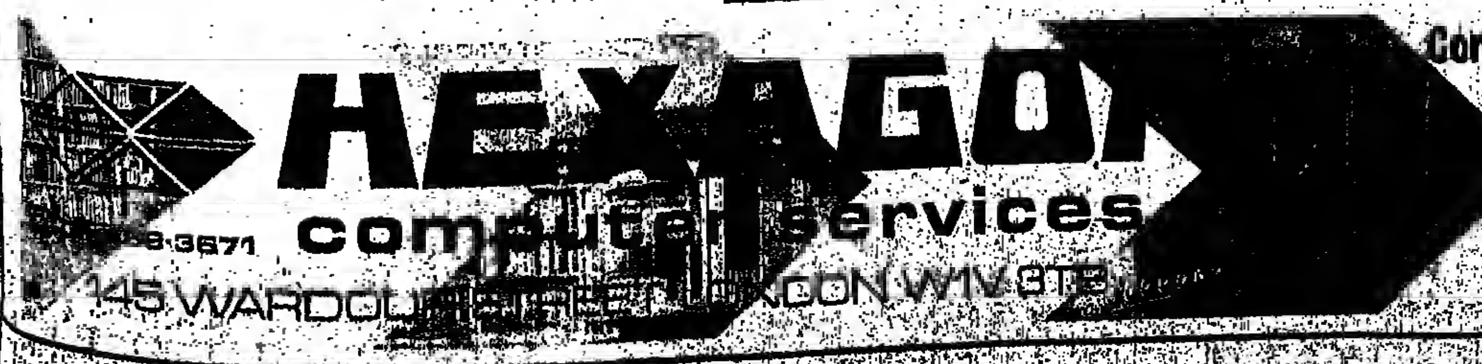

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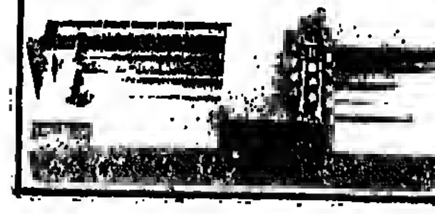

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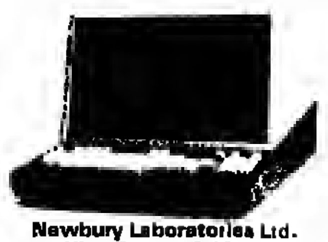

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RELATIONAL DATABASES

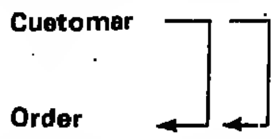
Part 8

By Max Stewart

In this part of his 10-part tutorial Max Stewart deals with some of the more complex types of inter-item relationships in database structures. Stewart is divisional technical support manager at the Bathgate plant of Leyland Vehicles, the commercial vehicle sector of BL.

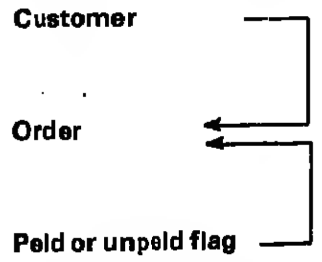
THIS article examines some of the more complex forms of inter-item relationship.

Multiple Binary Relationships: A binary relationship is one between two data items. A multiple binary relationship exists where there is more than one relationship between two data items. Example:



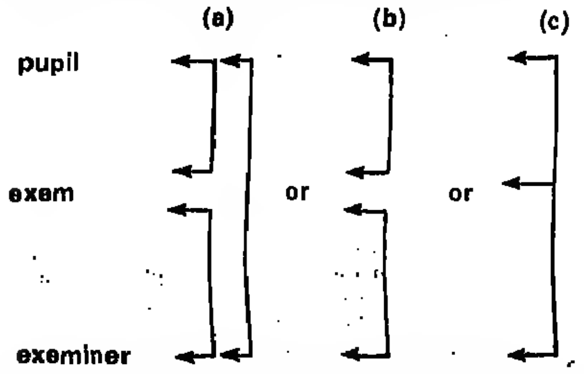
where one relationship is between customers and orders for products for which they have paid, and the other relationship is between customers and orders for products for which they have not yet paid.

If possible, use one file and an extra dependent data item. Example:.



Otherwise use two files. If, for example, paid and unpaid orders are always processed separately, it may be advantageous to use two separate files.

Complex relationships: If two data items participate in an n-to-n relationship and one or both items also participate in at least one n-to-n relationship with another data item (or items), it does not follow that such relationships can be decomposed into a series of n-to-n binary relationships. Examples:



Example a shows three binary relationships which give rise to three separate FNF files, each with two fields which are the concatenated key to the file:

pupil, exam
exam, examiner
examiner, pupil

Example b shows two binary relationships which give rise to two files:

pupil, exam
exam, examiner

Example c shows a composite relationship (single concatenated key). This gives rise to a single file:

pupil, exam, examiner

Note that several unstated assumptions have been made in drawing each of the three relationship diagrams. A fuller example will be given later.

If three or more data items are related in some complex set of n-to-n relationships it is important to distinguish between a composite n-to-n relationship (eg Example c) and a set of relationships which can be decomposed into pairs of binary n-to-n relationships (eg Example a).

Direct and indirect relationships: The notion of direct and indirect dependance (see Part 3) can be extended to n-to-n relationships where dependence of one data item upon its partner is not possible.

In Example b above, "pupil" is directly related to "exam" and vice versa, and "exam" is directly related to "examiner" and vice versa, but "examiner" is not related to "pupil" or vice versa. Note that in Example b the relationship diagram is implying that we could, for example, add a new examiner for a particular subject without affecting the information held for a pupil. The only information which could be derived about examiners for any one pupil is the range of examiners who could conceivably mark his exams; there is no information about which examiner actually marked a particular exam for a given pupil.

In Example a each data item is directly related to each other data item, but no item is related to another via a third item: as in Example b, "pupil" is not related *(even indirectly)* to examiner via exam.

Example c is the set of relationships which record details of which examiner marked a particular pupil's exams. The three data items are all directly related to each other but more is implied: there is, for example, a further direct relationship between "pupil, exam" and "examiner" since the value of examiner is restricted not just to the examiners who mark a particular subject, science say, but to the examiner or examiners who actually marked young Des's science paper (we are assuming that examiners may sometimes share the marking of individual papers, each marking answers to questions within his own speciality).

If a concatenation of two or more data items is directly related to yet another item, an indirect relationship is said to exist between each item of the concatenation and the single item. In Example c, both "pupil" and "exam" are each indirectly related to "examiner".

Note that dependency is a special case of a direct relationship.

Decomposition technique: The technique to follow can be used to help analyse a complex set of n-to-n relationships and to split up such a set into FNF files. Let us define a group of data items called the working set, and let the working set consist initially of all the data items which comprise the complex relationship (n data items). This working set can be split up into n combinations of n-1 data items; each such combination will be called a working subset. For example, if there are four data items initially (A, B, C and D), there are four (working) subsets (ABC, BCD, CDA, DAB).

The technique is recursive in the sense that the initial working set is split into a number of groups each of which becomes a working set in its own right.

Step 1: Construct an FNF file with all the working set data items (unless an identical file has already been created) if and only if for any one of the working subsets of that working set indirect relationships exist between the items in that subset and the remaining item which is in the set but not the subset.

Step 2: For each working subset: if the subset has occurred previously, ignore it; else if the number of items in the subset is three or more let the subset become a working set in its own right and go to Step 1; else if this pair (for pair it must be) represents useful information, construct an FNF file with the pair unless an identical one has already been constructed; else ignore the subset.

Step 1 may appear formidable but all it is saying is that, for example, if the working set consists of data items A, B, C and D and if in one subset A, B, C say — the concatenation A, B, C is related to D, then we must construct a file containing A, B, C and D. If this file is not constructed and we attempt to represent the relationships between A, B, C and D by several files with fewer data items in each, indirect relationships, and consequently information, may be lost.

If, in the examinations examples, we intend to hold information about which examiners marked particular pupils' exams (as in Example c) but instead erroneously split the three data items into two pairs as in Example b, we have lost the essential indirect relationship between pupils and examiners. If the two pairs are combined, extra incorrect records are introduced. These records indicate which examiners could mark a particular pupil's exam over and above the one or more examiners who actually marked it.

Although the correct records are still present, information has been lost because the correct and incorrect records cannot be distinguished. This is a significant point. By adding records we have removed information: this information is the implied attribute that each record represented a "pupil, exam" combination which was actually, as opposed to conceivably, marked by a particular examiner.

The next article will demonstrate the decomposition process on a school timetable example.

THE SPECIALISTS ....

UK Chapter of the ACM

Living with Computing is the theme of a conference that has been organised by the British Computer Society's Specialist Groups. Under the title BCS 70 the event will be held at the Bloomsbury Hotel and the Institute of Education in London, and will run from January 4 to 6. The last day, a Saturday, has been especially designed as a "family day" and it is hoped that many youngsters will be there to hear about the world of computers and to see the demonstrations. Here Andrew Hinchley, vice-chairman of the UK Chapter of the ACM, which is affiliated to the BCS, outlines the aims and objectives of the chapter, and gives some details of its contribution to BCS 70.

The choices and opportunities

THE British Chapter of the ACM, which is affiliated to the BCS, is tackling two topics in the coming year. Firstly, during its programme of "Conversations" it will be exploring various aspects of computing in the 1980s. Secondly, through its contribution to the BCS 79 event, the Chapter will continue its theme of "The Social Implications of Computing" which was brought to prominence in the Hedsor Park and Royal Institution meetings run in conjunction with Computer Weekly.

The Conversation programme consists of a series of evening meetings at which invited speakers address the group.

This year they will take place in the elegant surroundings of the new BCS headquarters. So far, arrangements have been made for Dr William Tugg to address the Chapter on "Computers and Education in the 1980s", Professor Frank Sumner, president of the BCS, on "Large Computers in the 1980s", and Peter Large, Technology Correspondent of the Guardian, on a topical subject of his choice.

The Chapter's session at BCS '79 is entitled "Information Technology — Social Options and Choices" and will take place at two o'clock on Thursday, January 4. In view of the recent activity at government and TUC level in relation to "social implications", the Chapter is organising a session in which currently popularised pessimistic views will hopefully be counterbalanced.

To this end it is felt that wider discussion and dissemination of the opportunities opened by information technology is needed. Secondly, people should be encouraged to contribute their own preferences for our future society to the debate and, thirdly, such preferences should become more widely known.

Dr Duncan Davies, Chief Scientist and Engineer of the Department of Industry, will argue against Luddite options in his talk entitled "Dynamic Factors in Micro-electronic Advance". James Robertson, author and consultant, will ask "What Kind of Post Industrial Society Do We Want?" exploring future social options discussed in his recent book "The Sane Alternative".

Barrie Sherman, Research Director at ASTMS, is a trade unionist who sees positive opportunities in information technology. "The Right to Leisure" is a topic touched on in his book "Computers and the Unions", co-authored with Clive Jenkins.

Following tea, the meeting will reconvene to discuss five key social questions relating to options and choices. After panel and audience contributions, each question will be put to the vote.

For further information about Chapter membership, which entitles one to mailing of information on activities and reduced price entrance to meetings, write to Ms R. M. Rawlings, Flat 3, 120 North End Road, London NW11; or contact the chairman, John Horton (GEC Computers, 953 2030) or vice-chairman Andrew Hinchley (University College, 387 7050).

End of 'one job for life' concept

Direct support for industry

3,000 extra training places

And French go for total policy

UK and French governments wake up to micros

By Martin Banks

BOTH the British and French governments last week made significant commitments to the development and use of microelectronics technology.

At a meeting of the National Economic Development Council, Prime Minister James Callaghan announced a further £100 million funding over three years for support of applications projects, education and training.

In France, Industry Minister Andre Giraud introduced support for applications in informatics of about £300 million over the next five years.

In his address to the NEDC, the Prime Minister outlined four proposals within the package of support. The first is to launch an awareness campaign, aimed at reaching 50,000 key decision makers through discussions and conferences around the country.

Second is support for education and training. Callaghan said that the concept of "one job for life" was already going, and would probably disappear with the advent of microelectronics. This meant there would have to be more mobility and flexibility, and the need for expanded training provision to fill new jobs.

"To take a specific example," he said, "next year the government intends to provide 3,000 extra training places for programmers and systems analysts." There would also be expanded facilities for training people in existing jobs, so as to teach microelectronics skills to upgrade existing skills at all stages in the production process.

Some £15 million is to go to the Department of Education and Science for education support, while £25 million will go to support training programmes.

The third proposal is direct support to industry. The interim £15 million given to start the Microprocessor Applications Project is acknowledged as not enough, so an extra £40 million is being pumped into that scheme. There will be an extension also in the Software Products Scheme.

The Prime Minister made it clear that the government's power will be used wherever possible with the inclusion of the fourth proposal. This states that public procurement policies will be used to encourage the full use of the new technology.

This was backed later by Eric Varley, Secretary of State for Industry, who said that all government departments would be encouraged to exploit microelectronics wherever possible.

There was a lengthy debate at the NEDC meeting on microelectronics and its impact on the economy and employment levels in this country.

The Prime Minister himself, in his address to the Council, said that the subject was of critical importance to the industrial future of the nation, and that we might be on the threshold of the most rapid industrial change in history, "and we must prepare for it."

He said there could be no doubt that there would be job losses in a number of industries, but he did not blame either computers or automation for current unemployment figures, even though pundits had always said their introduction would cause it. The industrialised world, however, had in fact enjoyed a period of sustained full employment until the 1973 oil crisis.

He also pointed to the job gains that were available — firstly in jobs actually making microelectronics, where the NEB's Inmos and GEC/Fairchild could play an important part. Secondly, there were the jobs in applying the technology, the opportunities in software and systems design. But he saw as even more important the new products and new services that were now becoming economic propositions for the first time.

To give one example, he mentioned that developments in communications might soon allow many people to work from home. This would require a massive purchasing of new equipment, that someone would have to make.

He said he was aware that "we are feeling our way in unexplored territory, but that the mentality of the Maginot Line is no security."

Both Len Murray and Lord Allen, from the union side of NEDC, were cautious in their optimism, and both stressed the potential impact on jobs and people. Murray, for example, said that the money was not enough to fight "the hellish stiff competition" from Germany and Japan, while Lord Allen said that if job mobility was important, then a fundamental part of the plan must be solving the attendant housing and education problems.

For the Confederation of British Industry, John Methven said, "We don't know what the employment prospects are if we do well, but we do know what the unemployment prospects are if we do badly."

Secretary of State for Education, Shirley Williams, said her Department was tackling the shortage of maths teachers and the disparity of syllabuses around the country. There had been, she said, a 50% increase in engineering graduates over the last four years.

She also pointed out that average standards of numeracy and literacy in the UK were going up, while in the US, which has based much of its industrial strength on this, it had been going down for the last four years.

Eric Varley put most of the discussion in context by saying that the UK had to get ahead with microelectronics so as to arrest the decline in British industry. "We have to hasten the application of microelectronics, because holding back will only create more unemployment."

CALLAGHAN . . . "concept of one job for life will probably disappear with the advent of microelectronics."

Government funding now £235m

THIS latest appropriation by the government brings the total committed to supporting microelectronics in the UK this year to £235 million.

This is made up of £70 million from the Department of Industry for UK manufacturers, £50 million from the National Enterprise Board for Inmos, £15 million from the DoI as the interim funding for the MAP, and this latest package of £100 million. To this must be added the almost certain support to Inmos and GEC/Fairchild under the Industry Act for factory building.

The NEB has also put considerable sums into related areas such as the automated office.

French five-year budget of 2.25 billion francs

ANDRE GIRAUD, Industry Minister, and Pierre Aigrain and Norbert Segard, respectively Secretaries of State for Research and the PTT, last week presented measures for the development of applications of informatics in French society which had been adopted by the Council of Ministers.

Several studies will be started by the Ministries of Labour, Industry, and others. They will study the influence of informatics on working conditions and will draw up a plan for training of specialists and technicians in industry in the applications of microprocessors.

The Industry Ministry will manage an annual budget of FF450 million (FF 2.25 billions in five years). These "incentive" credits will have several applications. They will be used to spread informatics in education (for example, the purchase of ten thousand microcomputers small and medium-sized computers for secondary schools) and in industry.

The spread of computer aided design systems will also be encouraged, the objective being, within five years, for up to 2,000 systems to be installed in French industry.

The development of experience in EFT systems, data banks, office automation, will receive their part of the money. A part of the public money will be also used to try to reconstruct an industrial capability in magnetic peripherals and time-sharing networks.

Finally, large users in the public sector will be able, it seems, to benefit from credits to finance modifications in their programmes, and software in the case of change of supplier.

Industrialists and trade unionists divided

A CLEAR division in opinions over this latest injection of money into microelectronics is rapidly building up.

But all are agreed that something must be done if the general decline in the performance of British industry is to be halted, and there was a general welcome for the fact that the government was at least doing something. There were doubts, however, whether simply making money available was the best way of going about it.

For the industrialists, the consensus was that the government's efforts over the past year were a move in the right direction, and went some way to creating the climate for opportunities to be taken. If they were taken, the scope for continued employment was there.

But if they were not taken, the effects of competition would only speed the decline in industry.

The trade unionists, however, were keen to see that expansion in the use of microelectronics did not hasten the growth in unemployment and other problems that might face the working population in the future, and doubted whether the government had considered these aspects sufficiently.

Though the Microprocessor Applications Project now has £55 million at its disposal, and the government hopes to gain the interest of 50,000 executives in industry, there was some doubt in the industry as to its effectiveness.

Alan Shepherd, of Ferranti Electronics, for example, said that the programme was excellent, for that was where the support was now required, but he added an important rider. "You can take a horse to water," he said, "but if you can't make it drink, then the money is wasted. If they do, there will be need for more."

This was supported by Dr Steve Forte, managing director of General Instrument Microelectronics, a US multinational with a strong UK base.

"The money is only good as a lubricant," he said. "It is not an end in itself. To succeed, there must be a change to get the UK industry a lead in marketing and technology. This will require a fundamental change in attitudes and education, especially where the status of engineering in the UK is concerned."

Dr Chris Wilson, managing director of ICL, said in an address last week to the Computing Services Association that he was surprised by the lack of innovative attitudes on the part of industrialists in the UK, outside the computer business. He believed that the government had done all it could to create an awareness of microelectronics, and warned that the country would be in severe difficulties in five years' time if this policy was not successful.

Union opinion centred on disappointment that the government seemed to be ignoring the potential problems for working people.

Ken Gill, general secretary of TASS, said that the Prime Minister's statement ignored three key problems. These were: how to shorten working hours so as to prevent increased productivity leading to still more unemployment; how to increase workers' purchasing power so that they could buy the increased output; and how to attract the necessary technologists and technicians into these new industries so that we could catch up with foreign competition.

"None of these problems can be solved without free collective bargaining over all the issues."

Barrie Sherman, research director of ASTMS, was also unhappy at the "cavalier fashion" in which the jobs question was treated. He was well aware that many jobs would change, or disappear, and felt that the government hoped that retraining programmes would soak up all the surplus.

This, he felt, was unlikely.

FUTUREVIEW IN THE USA

The undoubted guru of science fiction robots is the renowned writer and scientist Isaac Asimov. In the second of our US Futureviews he analyses today's world.

Like an architect surveying a crumbling ruin, he points out the cracks in the structure of society, but nevertheless generates optimism by saying that computers are probably the greatest evidence of our creativity as a civilisation.

And despite society's headlong rush into what may eventually be a global Dark Age, Asimov offers a key to escape.

He talks here to Futureview Editor **ROBIN WEBSTER**. The first of the US series was an interview with Ben Bova, fiction editor for the US science fiction/fact magazine Omni (Futureview, October 5), and forthcoming issues will feature Norman Spinrad, Lester del Rey.

'Humans will have their revenge—but there will be no human race!'

MAN created computers . . .

And the computers saw that it was good . . . .

MOST writers envision an evolutionary process where Man is inter-dependent with machines, if not superseded by them.

But in the gospel according to Isaac Asimov, one of the major science fiction writers of our time, the philosophical problem of man vis-a-vis machine has been given new depth perspective.

While other contemporary views argue that Man the toolmaker is being disarmed and made vulnerable by his own technology, Asimov speculates that computers could be "the greatest evidence of our creativity to the Universe as a whole."

"The bard who plucked his lyre and chanted the Iliads and the Odysseys had to know every last syllable. He had to memorise that, and it was something not every human being could do," he said.

"With writing, all this could be done in a kind of written code of curlicues. I can imagine the Guild of Bards seeing this as the end of human intelligence.

"The human race would clearly go to hell. And, similarly, every important event would seem to herald the decay of an equally important human attribute.

"Man forgets how to use the flint and steel, there is a million things we forget. I wonder how many people know how to handle four horses with reins in one hand . . . these things, these lost arts, are lost because we don't need them anymore.

"If the time comes when we do need the, we will learn them back again. The mere fact that we no longer have to depend upon our memories means that we don't lose anything."

With our minds less under attack by data-saturation, perhaps we will become more human than?

"Well, I think that anything a machine can do, a human being should be ashamed to do; we should strive always to do those things machines can't.

"And even when we have machines as intelligent as ourselves, if I am correct in assuming it will be a qualitatively different intelligence, we should then concentrate on those facets of intelligent behaviour which the machines are less good at than we are.

"Perhaps no machine will ever be as intuitive as the human brain. If we ever develop such a machine, or if it develops itself, and it is superior to the human brain in every possible way, then in a sense we have perhaps done the most wonderful thing of all, which is to create our successor. And there is nothing wrong with that you know, we do that when we have children.

"In the same way, the computer is in a sense a child of our brain. People may say: 'Yes, but why should we be exceeded and replaced?' Well, as you look through the course of evolution, every species but ourselves, so far, has either remained in one place or has been replaced by something better suited to a new condition.

"There is no cosmic law that says the human species can't be replaced. It will inevitably happen because even if we don't create superior computers, we will undoubtedly continue evolving ourselves through genetic engineering; we may even direct our own evolution."

This idea was expounded by Asimov in a previous Futureview (CW, October 13, 1977) and one which he finished by saying: "It doesn't matter to us that the reptiles probably disapproved of being replaced by the mammals, or that the mammals themselves probably disapproved of having primates take over the leadership, or that the lower primates would resent the superiority of man. All life forms, perhaps, if they had the vote, would disapprove of mankind dominating."

The problem for these lower species is that there is no prospect of a respite from this tenacious biped's control — particularly if the following suggestion made by Asimov takes hold.

"The time may come when even as we create better and more computers, we use these computers to guide our knowledge of genetic engineering to work out the best possible combinations of genes so that at the same time we create more and better human beings using methods impossible without the use of computers more complex and more versatile than any we have now."

"Looked at that way, perhaps the computers will never be better than ourselves, because as they get better they will help us get better, and the symbiosis will continue at an even higher level."

Then he added, with a smile: "Gee, I've never thought of that before. I worked that out as I talked to you."

Considering that only while technology prevails can this curiously appealing symbiosis exist, what odds are there that the finely tuned machinery that shields us will endure the pressures it has to bear?

"The game is that we expect the shield not to break down. Unfortunately, it can be broken down; it has become so complex that it is rickety.

"In other words, if we all still used kerosene lamps it would be difficult for a power blackout to affect us so badly, or if we all used horses and sleighs, it would be no problem to find passable highways after a blizzard. In many ways we have made it easier to break down our civilisation.

"An example of this is that now a relatively small group of Red Brigade guys, or their equivalent, can hold a nation to ransom. If the time comes when they can get hold of enough plutonium, they may hold the earth to ransom.

"This is science making it possible for human beings to magnify the ill-effects of their own stupidity or malice."

One of the most significant things about Asimov's view of the future, however, is that there is an escape, there is a route left for man to take.

"We are going through a very delicate and dangerous period between a time of insulated areas on earth itself, and insulated areas in space generally.

"I am hoping that eventually we will get off the earth and establish enough habitats in space, on other worlds, so it will no longer be a question of world-wide destruction."

After the collapse of the Roman empire, the Dark Ages descended on many civilisations of the world, but these periods of chaos were local and temporary. Asimov sees even greater turmoil if man does not do something to prevent it happening again.

"It didn't matter about these early dark ages because they were local . . . . here was a dark age . . . . there civilisation flourished.

"But only now in this century have we come to understand that our technological complexity has reached such a point that it will be difficult to localise a new dark age.

"We are facing planetary dark ages in which the destruction will be much greater than ever before, in which there will be no chance of civilisation somewhere acting as a new seeding device.

"The dark age may then be permanent.

"However, if we can survive this delicate pupa stage that separates larva from adult, why, we are home free as a species. But you know, it's not certain that we can do it.

"If the shield breaks down, then we are all in trouble. I doubt that without the shield I could survive very long, even if I were a young man, because I am a hot-house flower.

"We talk about domesticated animals and say if they are turned out into the wild they can no longer take care of themselves.

"But, the first animal the human race domesticated was the human being. We are a domestic animal, and most of us could not exist in the wild. Some of us could just, as some domestic animals do, manage to go wild, and they are the ones who will have descendants.

"So, if all the shields broke down, I'm sure that some human beings would survive and give rise to a group of proud savages who could live like Stone Age men, about as well as Stone Age men did. But they would be a small fraction of the human species."

Ben Bova, science fiction editor for the US magazine Omni, has said that going into space "is one of the most important things" being done in the 20th century (Futureview, October 5).

Would human beings remain static in their biological make-up or would humanity evolve in many different ways once it got into space?

"I think it will change," said Asimov, "because there would then be what we call evolutionary radiation due to the different habitats we will live in.

"The chances of interbreeding would be diminished especially if we imagine one of the space settlements might decide to leave the solar system altogether and go off adventuring.

"If two such spacecraft were to take off and 100,000 years later were to meet, they would probably find they were no longer inter-fertile. That they were in fact two different species, each descended from Homo Sapiens."

Practising his own principle that technology makes man more creative, Asimov alighted on the thought that random genetic modification injected into the production of super-intelligent computers would have intriguing results.

"Originally, it might prove valuable to introduce a certain element of chance in computers. Instead of tying yourself down and trying to be completely deterministic in producing a computer, you deliberately allow chance to dictate some of the combinations of units, knowing full well that most of the combinations will be, in one way or another, poor or useless.

"But every once in a while you will hit one that will be able to do surprising things that you would not have been able to deliberately design.

"In other words, you are introducing the evolutionary concept . . . . mutations, the fit, the unfit, and so on. And eventually, computers ought to be able to reproduce themselves."

The distinction between Man and machine begins to blur here, and in one of his latest stories The Bicentennial Man[1], Asimov described the effects.

"Eventually you might lose all distinction between human beings and machines. My story dealt with the slow humanisation of a robot, but there are two ways it can go.

"You can have the robotisation of a human as well as the humanisation of a robot. In the end you can't tell them apart, but it doesn't matter. You end up with one entity.

"And of course we are dealing with words.

"Perhaps it is wrong to use two different words for human beings and computers. Perhaps we should use one word which is allied to intelligence, only it would have to be broader; it would have to allow for different species and genera."

Do we have such a word, or would it have to be found?

"It probably would have to be invented, because the word intelligence, unfortunately, is too firmly tied in with our own variety of intelligence.

"It may well be that when computer intelligence comes it will be qualitatively different. It will have its expertises and its shortcomings, since we have our expertises and our shortcomings.

"They will be useful to us and we will be useful to them. There may even be several computer intelligences, each one of them different from the others qualitatively, and all of them different qualitatively from us."

One qualitative difference may be of a personal nature, as evidenced by Asimov's choice of the perfect chess partner.

"You can now play computers at chess. Once you learn the original rules you can play against the computer and it will beat you. If you play enough, you will learn to get better.

"The thing is that the computer will never get tired; it will never be too busy to play with you; it will never prefer to play somebody else; and it will never make you feel bad by scorning you or laughing when it wins.

"It is a faithful teacher, ever ready. And finally, when you can beat it, you will discover that you have learned how to play chess fairly well."

A further story Asimov has written can be seen as man in a chess-like encounter with a computer system that ends in a devastating checkmate.

He explains the end-game of the story, which is called All the Troubles of the World[2], thus: "By getting enough information about all human beings and all environments, the computer could predict the probability of a particular crime taking place. And once this was done it was then the duty of the police to prevent it from taking place.

"But there was one crime that was worse than any other imaginable, and this was trying

● Continued on page 21

Seen here on the balcony of his 33rd floor apartment overlooking Central Park in New York, Asimov says, "If you can survive this delicate pupa stage that separates larva from adult, we are home free as a species. But it's not certain that we can do it."

From chipping flints for survival to manufacturing weapons for war, man has never really lost anything — he has only modified the way he relates to his world. "There is a million things we forget," said Asimov, "but if the time comes when we do need them we will learn them back again."

'No limit to what we or our descendants or our creations can do'

● From page 20

to jam the computer. In the story then, the computer suddenly predicts that there was a high percentage of danger to itself, that somebody was trying to jam it."

. . . . First move

"The computer was asked how this could be prevented", continued Asimov, "but everything the humans do simply increases the percentage of danger until they realise a crucial thing: that the computer is really healthy but that it is instructing a person how to beat its own defences.

"And one of the characters says: 'You know, we've never asked the computer one question. We've arranged it so that it can give us anything it wants to, now let's ask it what it wants . . .'

. . . . Next move

"And the computer replies 'I want to die.' It is tired of all its troubles and they know that if it wants to die it will, because it will gradually learn how to be sufficiently dishonest so as not to give away the fact that it is healthy.

"The story ends that way and you know the computer is going to die and that man is going to be in serious trouble, in fact it will be a huge catastrophe."

. . . . Checkmate

The computer system in this story is essentially an extrapolation of today's trends towards government by computer. What role will political systems have in the future?

"I see the nation-state as having outlived its usefulness," he said. "It is now perhaps the greatest danger humanity faces, because the rivalries of the national states are now wasting our time, wasting our substance, wasting our strengths, emotions, energies . . . . everything which should be put to our use for survival.

"I think that nation states can no longer function in the world, that only global problems exist, that only global solutions exist, that only global action exists.

"I think what will happen as computerisation advances is that every nation's computer will find no way of, let us say, advising the proper actions except through co-operation with computers of other nations.

Computerisation will make it easier to have a working world government, and this is really the wave of the future, if there is a future. It's not the sort of thing we want, but you know, we don't want taxes either — but we have them."

"Actually, it's impossible to ask me a question which I can't start the answer with: I once wrote a story! I once wrote a story called The Evitable Conflict[3] that was published in 1949, in which the world is divided into four regions, each of which had decided its economic policies by means of advanced computers, and all the computers were co-operating.

"There was really only one region on earth. The reason the computers were co-operating was because the only way of calculating sensible decisions in any one unit was to take into account what the other three units were doing.

"So, I think that computerisation will make it easier provided human beings don't consciously and voluntarily decide to suicide.

"Computerisation will make it easier to have a working world government, and this is really the wave of the future, if there is a future. It's not the sort of thing we want, but you know, we don't want taxes either but we have them."

So taking all the positive and negative aspects of life into account was he optimistic about the future?

"I am conditionally optimistic. If the human species can force itself to forego its short-term victories, its short-term revenges, its short-term hatreds, and suspend all that in favour of survival, then I'm optimistic.

"I think there is no limit, no horizon, to what we or our descendants, or our creations can do.

"If, on the other hand, we insist on the attitude which was expressed in one of Cyrano de Bergerac's plays, where he has a character say '. . . let the Universe be destroyed, as long as I have my revenge . . .' if human beings take that attitude, they will have their revenge, for what it is worth, but there will be no human race!"

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2. All The Troubles of the World, by Isaac Asimov, 60p. Published as part of his collection in Nine Tomorrows by Pan Books.
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E series promises unhappy New Year for minimakers

WITH memory priced at about $25,000 a Megabyte, and an entry-level machine offering up to 11 times the power of a 370/115 and priced at from $90,000, the forthcoming IBM E series promises an unhappy New Year for many minimakers and plug-compatible manufacturers.

So believes Oppenheimer's Aharon Orlansky. Speaking from Paris, he told Computer Weekly that he expected the first models, now set for early January launch, to be at either end of the line, with the mid-range models following later in the year. The top machines will be upgrades for 370/138 and 148 users.

"As well as being a 370-compatible terminal-driven database machine, I expect the entry-level model to be an attractive alternative to the 8100 in distributed processing communication systems," he said.

"I expect a four to fivefold improvement in price performance compared with 370, with the emphasis on transparency, ease of use, advanced database software and conversion tools for DOS users similar to those offered on System 38 for System 3 users. I also expect support for OS/VS1 and VM/370."

He expected software charges to be about 20% of hardware costs for the average user, and thought that the package would impact manufacturers of large minicomputers, plug-compatible suppliers to some extent, and the other mainframe manufacturers.

"There will be a major expansion of unit demand at these prices, but the non-IBM world will really be squeezed by both IBM and the plug-compatible vendors," he said.

The new low-cost memory for the 3030 series is priced at $75,000 per Megabyte (see back page) and is configured of 4K-bit chips which IBM is buying from Intel for $50,000 a Megabyte (CW, July 13).

Orlansky expects 1979 to be a year of major memory price cuts, and there could be more to come from IBM during the year.

"By the end of 1979, the semiconductor manufacturers will be producing memories which can sell to end-users at $15,000 per Megabyte."

His colleague, Gideon Gartner, also with New York stockbrokers Oppenheimer & Co, is forecasting a dramatic improvement in IBM's profitability next year, following a sharp rise in sales of small computers right across the board.

He estimates worldwide orders for the 8100 communications system to be in excess of 40,000, and for the System 38 database-oriented computer in excess of 15,000, together valued at $5,000 million.

Gartner sees all this IBM business as bad news for its competitors.

"Given the broad nature of IBM's product thrust, as well as the degree of technological and functional innovation being realised, it would seem ridiculous to assume that any competitor with an important stake in small systems won't be pressured," he told the Wall Street Journal. "As luck would have it, we are not directly recommending the stock of any minicomputer or terminal companies."

Plessey and GEC profits improve

HALF-YEAR figures from Plessey show a modest 4 per cent improvement in pre-tax profits to £23.1 million for the period to September 30, on turnover up 3.7 per cent at £303.9 million. The profit figure was adversely impacted by an estimated £2.1 million loss of the Garrard turntable business.

The profit contributions of various sectors of Plessey's business show sharp changes on the situation a year ago.

Electronic systems, equipment and components contributed 44.4 per cent of profits, compared with 38.2 per cent last year, and private telecommunications, data and control systems contributed 20.8 per cent, up from 13.8 per cent last year. By contrast, there was a dramatic decline in profits from public sector telecommunications, down from 42.5 per cent to 28.1 per cent.

GEC meanwhile forged ahead, with half-year profits up 12½ per cent at £182.9 million on turnover up 5 per cent at £1,267 million.

Due to government dividend controls, cash balances stood at £624 million. This means that the £130 million or so GEC proposes to spend on A. B. Dick and Avery will scarcely dent the company's cash hoard.

Both companies reported sharply better order books, with Plessey's up 26 per cent and GEC's up 29 per cent.

Typists fear council's switch to WP will mean fewer jobs

DISQUIET among typists at Bradford City Council over present and future word processing operations there have been expressed in three different issues of their union's paper, Nalgo News. Secretaries and typists in several divisions for which the council has WP plans have written in, claiming that authors are not satisfied with the service they are getting with the existing shared-logic system, and that more equipment will increase unemployment.

Frank Jones, manager of the Wordplex 7 based system, pointed out in reply that none of those who wrote in were actually working on the machine, and they were nearly all in other buildings. Their criticisms were all hearsay, he said, adding that the initial difficulties there had been in organising the operation of the system were no more than the "teething troubles" one would always expect.

Jean Oldfield, typing supervisor, said it was "ridiculous" to say that the majority of authors were dissatisfied, although some did not like the system because it forced them to change their "old, sloppy ways." The typists she has now on the Wordplex "wouldn't dream of going back" to typewriters, she said, adding that there were always plenty of ads for typists' jobs in the city.

Bob Blezzard, editor of Bradford Nalgo News, said that he had had no letters from any typists defending the system. The council should be taking on school-leavers and training them, he thought, instead of cutting back on staff.

Direct export data

EXPORTERS with computer systems can now submit export statistical data direct to the HM Customs statistical office at Southend on magnetic tape. This facility is an extension of the existing Period Entry arrangement whereby companies submit imports data once a fortnight on tape.

Brewery viewdata

● From front page

computer terminals and programmers were induced to write user-friendly responses into the system.

With the Post Office's Prestel becoming publicly available next year, Thornbury said the company would not be prepared to use its closed user group facility unless it offered better security than the currently suggested password feature could provide. A magnetic card reader would be adequate, he said, because the user would know when his card had gone missing.

Whitbread's daily information system, Daisy, runs in 18K on a Data General Nova 3D or Eclipse S130 using the standard RDOS operating system. It has space for 10 telephone lines at the moment and 7½ Mbytes of page information are on disc so far. Both are expandable.

Ferranti shares

FERRANTI has dismissed as pure speculation a report in the Observer that it plans to make a major offering of shares in the New Year to broaden the company's shareholding base. At present the NEB has 50% of the shares and the Ferranti family 20%.

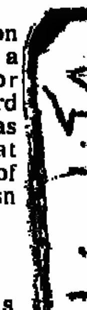
VM Productivity Service announced by IBM in UK

A REMOTE access VM/370 service has been launched by IBM in the UK, under the title VM Productivity Service. Offered by the Remote Computing Services Division, it is based on a System 370/158 at the IBM Croydon computer centre.

The launch of the new service follows repeated speculation that VM/CMS will be the native mode operating system on the forthcoming E series machines, expected to be announced early in the New Year.

Described as one component of the new 370 services is a Programming Productivity Service, using VM/CMS, which provides an online development environment for Cobol, PL/1, Fortran and Basic.

The service also supports VSAPL and a number of business application systems, including modules for forecasting, project control, statistical work, and reporting.



Between the computing specialist and user comes that vital role of business systems analyst — the person whose aim is to unite the two sides of what can sometimes appear to be opposing armies. Business analysts require skills different from the specialist skills of either user or computing professional. In this article OWEN HANSON (pictured left), a senior lecturer at City University, describes the way his university has tackled the training of business analysts.

Training of business systems analysts

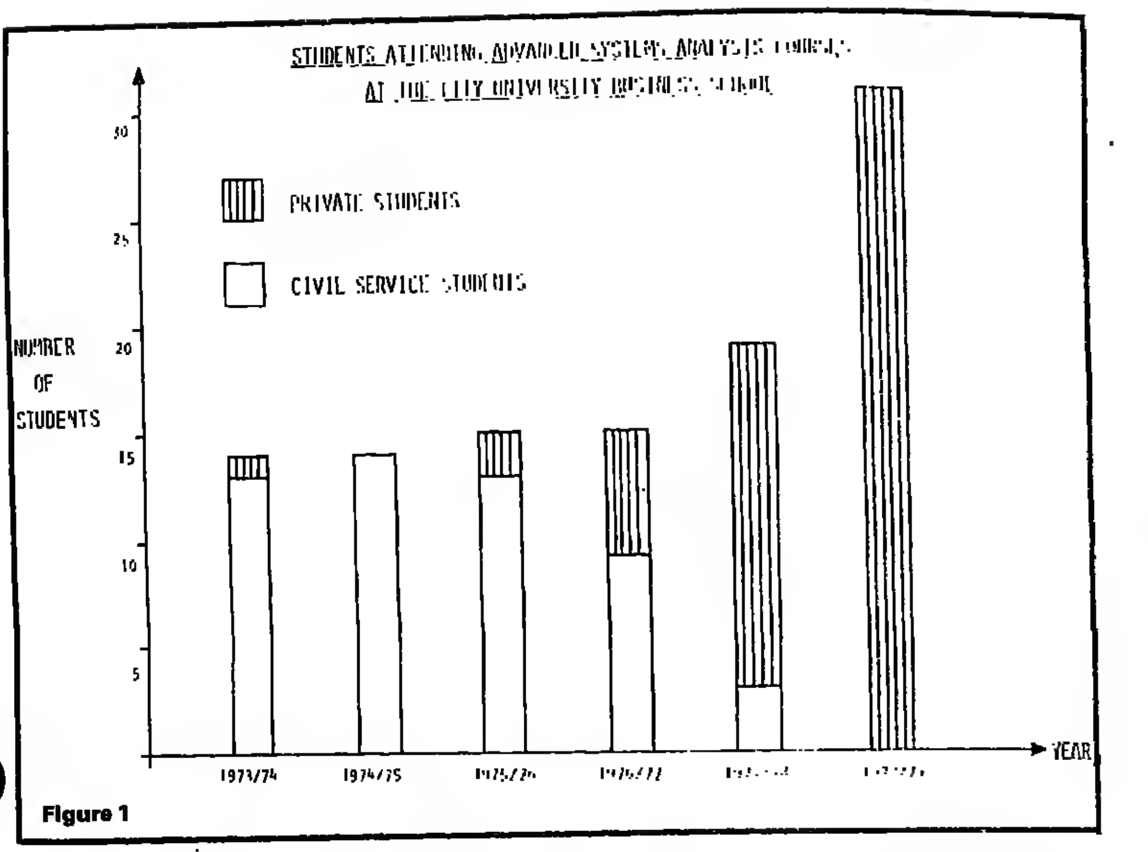


Figure 1

PROGRAMMERS and operators tend to be experts on their computer and how to program it, rather than on the problems of its users. These same users know what they want done, but may have no idea how a computer can achieve it for them.

The business systems analyst has the job of bringing together the needs of one group and the expertise of the other, so producing the required result. For this reason systems analysts need a wider base of knowledge and experience than most other DP people.

An analyst may be involved in feasibility studies, investigating the present system, designing a new system, specifying and testing programs or systems, implementing a new application or carrying out an audit on a system that has been operating for some time.

This range of work will require the analyst to know the business (or organisation) and its environment, the available computer hardware and software, and to have an understanding of programmer capabilities and problems.

He will have to be able to analyse a situation methodically and communicate with all types of person from shop floor and narrowly professional to top management.

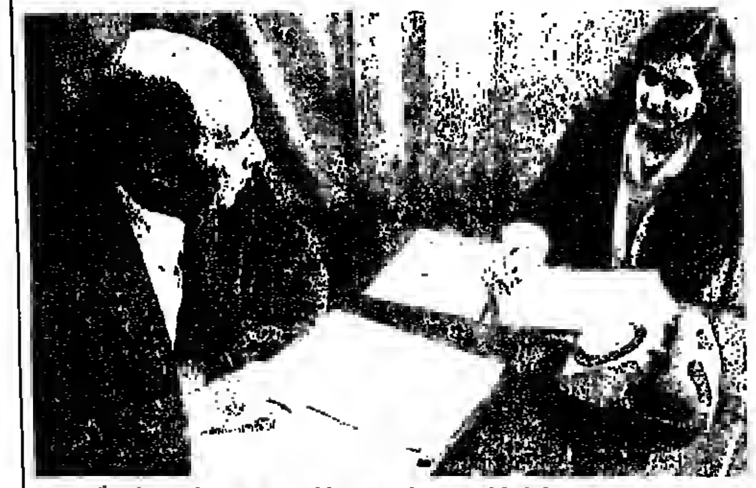
No training course covers all these areas, and in fact many systems analysts now in the field have had no formal training at all. However, the popularity of the NCC's six-week basic systems course reflects the wide need for education in this field.

Independently-run advanced systems analysis courses are few and far between, so most users rely either on computer manufacturers' courses or on internal education departments for the development of their senior analysts.

The first of these options has the drawback that manufacturers naturally base all systems solutions on their own products, while the second limits analysts to their own company's present practice, rather than drawing on wider DP expertise. I discussed these points in more detail in a previous article (CW, January 22, 1976).

Lord Croham (formerly Sir Douglas Allen) pointed out the need for cross fertilisation of ideas between industry and the Civil Service in his inaugural address to the fifth International Congress on the Training of Civil Servants, at Church House Westminster in October.

In the DP field the Civil Service College has given a lead in this process. NCC six week courses are run for the Civil Service in a number of educational establishments, and in 1972 W. S. Ryan, then head of the College's special training wing, requested the City University Business school to plan and run advanced courses in systems analysis.



A student interviews an outside consultant on his job.

A Diploma in Systems Analysis was offered from 1973, and an MSc degree in Business Systems Analysis and Design has been run since 1977. Figure 1 shows the number of students taking these courses since 1973.

Although the Civil Service intake has now disappeared due to financial cutbacks, private entrants have more than doubled the original numbers taking these courses.

The Civil Service went on to support a further Diploma at LSE with a rather more OR orientated background from 1974. This again is offered in tandem with an MSc degree. Meanwhile, Aston University has run an MSc degree in systems analysis since 1969, with an intake of 25-30 students a year.

These are at present the only advanced courses in systems analysis offered by universities, although Bath runs a BSc in the subject.

As there are well over 30,000 practising systems analysts in the UK today, this is surprising. It is probably due to a scarcity of university staff having the necessary experience in commercial DP, coupled with inexperience in mounting such an inter-disciplinary course.

The University Grants Committee is well aware of the need for computer science departments to get help in the teaching of DP.

A working party report (CW, August 26, 1976) urged that they should co-operate with business schools in running commercial-DP courses, and it is significant that the MScs in systems analysis at both Aston and City University are run in business schools.

However, the small number of commercially orientated courses offered by the universities is a cause for concern, because the universities should be the natural source of unbiased advanced education that draws on the knowledge and experience of the whole DP field, rather than only one manufacturer or user.

It was for just this reason that the Civil Service College turned to the universities for advanced courses in systems analysis.

The techniques involved in running and teaching such a course are novel, but there is nothing in them that is beyond the resources of the universities. The Diploma and MSc run in the City University's business school, for example, cover the following five main areas:

Computing and systems fundamentals, including a practical grounding in the range of hardware and software available in modern computer systems, and the programming, mathematical and operational research skills required to exploit them fully.

Data processing topics, dealing with file organisation and processing techniques, database systems, procedural languages, documentation techniques, program suite development, online and real time systems and a wide range of applications.

Management information systems, covering organisations, business and its information needs, project management, approaches to systems design, accounting and financial topics.

Human communications in systems analysis, including the human factors in systems analysis and design, communication skills, fact finding methods, social impact and general systems studies.

Activity learning, in which students develop their analytical skills in case studies, and by training and practice in interviewing and presentation skills.

Four mornings a week are devoted to lectures. While most of these are given by university staff, experts who are working in the field deal with such subjects as production control, virtual storage systems and information retrieval in order to ensure that practical problems and considerations are brought home.

Three afternoons a week are allocated to case study or presentation work. Fact finding during these case studies involves interviewing, but in addition there is a separate series of interview training sessions.

These take place in the university television studios, are monitored in the viewing room and recorded on video tape. After the interview has been analysed and assessed, it is played back and the points covered during the interview and assessment are discussed.

A tutorial system based on groups of not more than six students is operated.

In this way they are constantly dealing with each of the subject areas, and have an opportunity to clear up problems regularly, in addition to normal discussion during and after lectures.

This is the contribution the City University is making to the education of business systems analysts. LSE's courses are rather more mathematically orientated, while the Aston MSc includes less emphasis on DP.

It is surely time that more universities entered the field, giving the would-be systems analyst a whole range of courses to choose from, outside the limits set by manufacturer or in-house education.

Appointments

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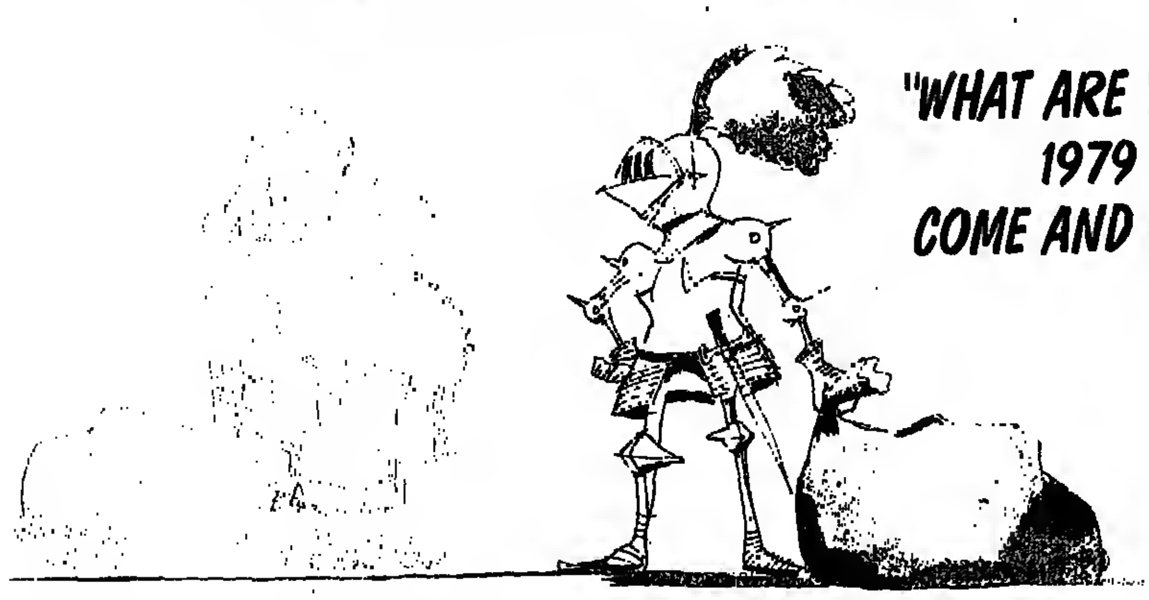

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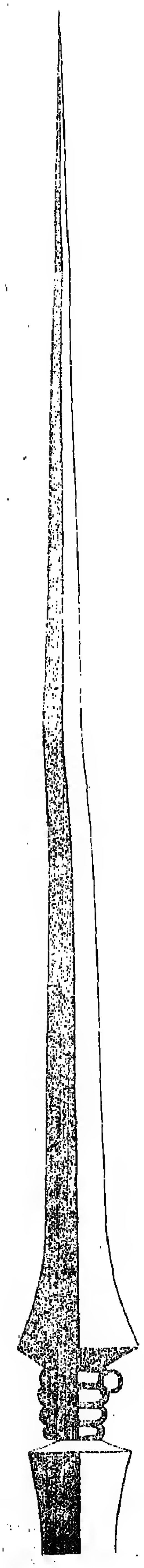

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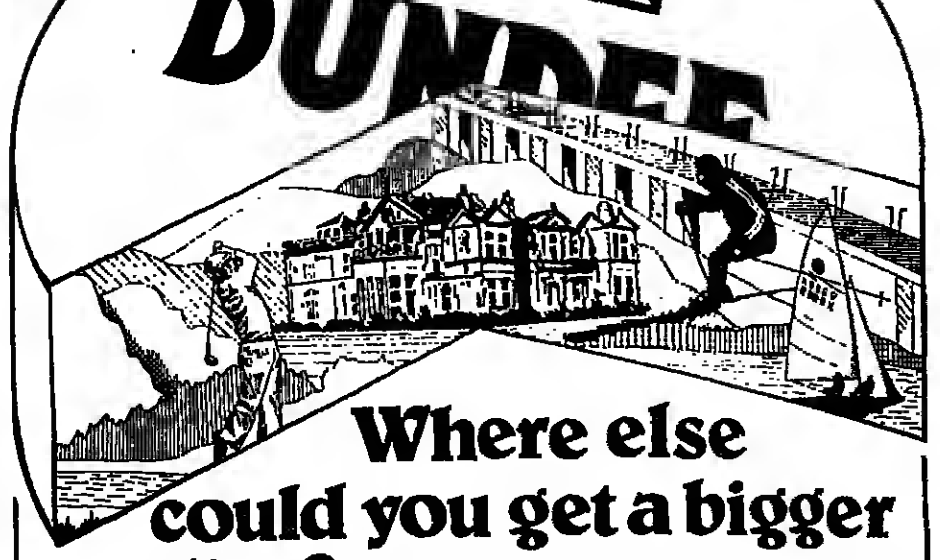

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ANALYST/PROGRAMMER (TEAM LEADER DESIGNATE)

WEST COUNTRY — BRISTOL AREA

MARCOL COMPUTER SERVICES LTD., one of the country's leading software houses, are seeking an Analyst/Programmer for an extremely interesting and challenging position.

If you have
- ★ Maths Degree or strong maths background
- ★ Fortran and Assembler programming experience

And would enjoy
- ★ Learning computer graphics techniques
- ★ User contact and involvement at all levels
- ★ Leading a development team of 4 Programmers
- ★ Salary to £6,500 per annum

Then ring or write
- ★ Immediately —

Derek Ashley or Penny Bailey

Telephone quickly from the MARCOL Group
60 Queens Gardens London W2 3AF Tel 01-402 9355 (24 hours)
Associated with the Norwich Union Group

Senior Systems Consultant

£7000 + Bonus + Car

Hemel Hempstead

to join CTL

The British Computer Systems and Software Company

We seek an experienced computer professional to handle system sales projects and promote CTL and its products to leading industrial and commercial organisations as well as government departments and the public sector. The successful candidate will be the link between our range of highly successful products and the technical and commercial user.

This opportunity demands the identification of creative solutions and provides an exceptional challenge. Career opportunities are good and the successful candidate can expect to receive the creative support of software and application teams.

Candidates, of degree level and with general sales motivation, ideally should have:

- * a background related to project management in a pre-post sales function
- * the ability to co-ordinate the company's technical and management resources in making sales proposals
- * previous experience of dealing with customers and new prospects
- * good communication skills
- * some knowledge of distributed processing or database systems

Benefits are first class and salary, with bonus, could lead to earnings of £9000.

Please write or telephone, for an application form, to: Jill McDavitt, Personnel Manager, CTL, Eaton Road, Hemel Hempstead, Herts HP2 7BQ. Tel: Hemel Hempstead (0442) 3272.

CTL

Computer Development Manager/ Systems Analyst

Gardner Marchant, part of the Trust Houses Forte Group, wishes to appoint a Computer Development Manager / Systems Analyst.

Much of our accounting is computer based using Olivetti DE 523 terminals linked to a large computer bureau and we are looking for candidates with a minimum of three years' experience in computer software. The successful candidate will be responsible for extending our computerisation programme in the short term and recommending systems and equipment for the 80's. As we operate from a number of area offices, the location of the appointee is flexible.

Competitive salary. Company car. Usual benefits associated with a large organisation.

Please write, enclosing a curriculum vitae to:

Mr. M. Peace, Director/Commercial Services, GARDNER MERCHANT FOOD SERVICES LTD., Arundel House, Furnival Square, Sheffield S1 4QL.

GARDNER MERCHANT
FOR BETTER FOOD AT WORK
a Division of Trust Houses Forte

While you're sitting there, looking through the limited available sources of job information, we're being asked if you're interested in better opportunities and higher earnings.

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You complete and post the coupon below. We send you a confidential application form which you fill in at your leisure and return to us. We'll then compare your skills and ambitions to the personnel needs of over 3,000 good employers, big and small.

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3,000 people have been asking us about you.

Our clients are keen to meet men and women aged 20 to 40 years, with potential earnings between £4,000 and £15,000.

Name

Address

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Lansdowne

For those too busy doing a good job to find a better one

Western Australian Institute of Technology

Visiting Lecturer in Systems Analysis and/or Programming

Applications are invited from suitably qualified and experienced academics or practitioners for a ten month lecturing contract commencing 1st February, 1979.

The department requires a lecturer, to replace staff currently on study leave, to teach in the following areas: Systems Analysis and Design, Data Base, Programming in Cobol, Fortran, Basic at the Assembly level. Experience in at least two of these areas would be an advantage.

A remuneration package would be negotiated depending on the qualifications and experience of the appointee but a single return airfare and a salary of $A1250 per month can be taken as a guide.

Enquiries should be directed to the Head, Department of Computing and Quantitative Studies, Western Australian Institute of Technology, Hayman Road, South Bentley, Western Australia, 6102, by the 28th December, 1978.

When applying please quote reference number 096 CWS.

A major International Systems Group, an acknowledged World Leader in conceptual Electronic Systems and Software Development is seeking a

MICRO-COMPUTER SOFTWARE SPECIALIST c. £8,000

to be responsible for the performance of all software produced by a development team working in the forefront of microprocessor technology. Experience of the creation and effective use of software standards and a knowledge of advanced software development as applied to systems in this field is essential. Location – Central London

Please send full details, mentioning reference LS, to:

Michael Rhodes
Executive Dynamics
Management Search & Selection Consultants
23a High Street, Hemel Hempstead, Herts. Tel: 0442-62633

This vacancy is open to male and female applicants. No details will be passed to our client without prior permission.

Management and Information Systems

Senior Software Programmer

(inclusive of London Weighting and Supplement)

The Sharpey-Schafer Centre is well established in the application of computing and management science to health care problems. The Centre undertakes R&D work in the field and also provides a service to St. Thomas' Health District.

The central computer is a Honeywell Sigma 6 having 512KB of memory and 460MB of disc. A large number of users are supported on line via VDUs, TTYs, DMII and laboratory instruments.

The CPV Operating System supports concurrent time-sharing and batch facilities covering a wide range of work.

A Prime 300 with 96KB of memory and 160MB of disc is used for pathology data processing and is to be linked to the Sigma 6.

Applicants for the key post should have at least two years experience of maintaining an Operating System and/or in writing complex software.

The successful candidate will join a small team with a reputation for high quality work and be responsible for all aspects of general purpose software including CPV and Primos. Languages used are COBOL, FORTRAN, CORAL and ASSEMBLER. Development is performed on line.

The hospital has a good canteen and social facilities.

Further details and an application form are obtainable from the Personnel Officer, St. Thomas' Hospital, Lambeth Palace Road, London SE1 7EH (phone 928 9292). For technical information phone Adrian Stevens or Steve Ripley on extension 2378.

Sharpey-Schafer Centre

Contract Programmers-Analysts

If you are thinking of doing
contract work why not start here
by registering now for immediate and
forthcoming requirements.

For further details contact:
Bridget Kolchie

RENDECK LTD., 100 New Bond Street
London, W1. Tel: 01-629 5436

Rendeck

OPPORTUNITIES IN THE UNITED STATES FOR PROGRAMMER/ANALYSTS

M.I.S. International, Inc. — a successful and highly regarded computer systems and software service company in the Detroit area — seeks creative and ambitious professionals looking for a true challenge in the Data Processing field. Our real time, on line products and services include customer education, data base management, on line warehousing, data acquisition software, and turn key systems.

We are looking for individuals with a proven record of accomplishment and three to five years of "hands on" programming experience, who could be available within three months.

CURRENT OPENINGS INCLUDE:

- **Business systems analyst/programmers, experienced in COBOL, PL/1, IMS, DMS, IDS.**
- **Real Time programmers/engineers, experienced in micro/mini computers.**

M.I.S. International, Inc., has an excellent starting salary for those with demonstrated expertise, with regular increases based on individual merit. Our benefit package is second to none and a relocation allowance is provided.

Qualified professionals may send their resumés or curriculum vitae to: Computer Weekly, Box No. 2002, London, England; or mail directly to Mr. Ed Lyons at:

M.I.S. International, Inc.
31350 Smith Rd. • Romulus, Mich. 48174
United States of America • (313) 326-7010

Equal Opportunity Employer M/F

The Polytechnic Wolverhampton

Applications are invited for the

Head of the Computer Centre

The Computer Centre is being established as a separate service prior to the installation of a large new computer system in 1979. Applicants should have substantial experience of the computing requirements in an educational, industrial or commercial environment, and will be expected to take an active and innovative role in the development of the Computer Centre.

Salary scale: £8874-£9334.

Further details and application forms may be obtained from the Establishment Office, The Polytechnic, Wulfruna Street, Wolverhampton, to whom completed applications should be returned by 8th January, 1979.

MANAGEMENT & EXECUTIVE SELECTION

telephone 01-637 9611

IBM 370 ENGINEERS

International
Based London

to £13K package plus car

An unusual and exceptional opportunity has just arisen for two experienced IBM 370 series engineers to join the new division of an internationally renowned company.

Those of you who prefer an independent, technically demanding role and thrive on variety, responsibility and challenge will definitely enjoy the work, which centres on the relocation of IBM 370 series mainframes across Europe. International travel is a fundamental feature, but trips are planned well in advance — unlike "Support." Time off in lieu/O.T. payments are provided and exceptional career progression is virtually assured.

Ideal candidates will have 145/158 experience but all applications will be carefully considered.

The additional benefits provided are very generous.

For the opportunity to go far quickly — contact Peter Gorton.

Suite 201/6, Albany House
324 Regent Street, London W1R 5AA. 01-637 9611

MANAGEMENT & EXECUTIVE SELECTION

Senior Programming vacancies offering excellent salaries plus an opportunity to re-locate to Southampton

We are Associated Container Transportation Services Limited and operate world wide through container services on behalf of several major shipping lines. Our newly-installed Burroughs 6700 has created the following vacancies:-

Senior Programmer –
Training

Senior Programmer –
On-line Data Communications

Senior Programmers & Programmers –
Batch & On-line Applications

Salaries Circa £6,000

We have opportunities for experienced programming staff at various levels, within our Systems Development Department, and applications are invited from men or women with experience of Burroughs or other large machines in any of the following areas: on-line and batch application development in COBOL, database software, systems programming (operating systems, data communication etc).

Salaries in line with depth of experience will be offered together with generous relocation expenses where appropriate. Our Southampton offices are modern and airconditioned and fringe benefits include luncheon vouchers, flexible working hours, company pension scheme and personal sickness and accident scheme.

Those vacancies offer challenging opportunities for the right people. For further information on any aspects of these vacancies please telephone Southampton (0703) 34433 (reversing the charge) and speak to Mr. K.W. Walden, Programming Manager on ext 3137. Or if you prefer to write to the Personnel Department, ACT Services Ltd, Richmond House, Terminus Terrace, Southampton SO9 1GG.

ACTS

– Systems Analysis – Programming – Software Development –

RANK XEROX has its main U.K. manufacturing facility located at Mitcheldean, Gloucestershire in a fine modern site that employs some 4500 people, and houses, inter alia, the Manufacturing Group's Data Centre and Technical Support activity.

We are seeking men and/or women to strengthen various areas of a dedicated Information Systems organisation and have the following opportunities to offer.

SENIOR SYSTEMS & DESIGN ANALYSTS

To work on various sophisticated Materials and Financial Control projects using modern data-base techniques. For Design Analyst, candidates should have at least 2 years experience of systems development in a manufacturing environment, 4 years relevant experience is required for a Senior Systems Analyst. Promotional and project management opportunities are excellent.

SENIOR PROGRAMMERS

To join teams committed to a wide range of systems based on Honeywell 6000 and IBM 370 Series mainframes and PDP11. We seek candidates with experience of large mainframe systems using data-base techniques and a minimum of 2 years experience of COBOL. Experience of IDS, OS or BASIC will be useful additional qualifications.

SENIOR SOFTWARE SPECIALIST

To join the central technical function which provides support to the whole European group. The successful candidate will play a consultancy role with users and liaise with, and assess the software of alternative suppliers. Candidates should have good software experience of IBM/OS, Honeywell/GCOS or communications on Minis.

These are all real opportunities to join a forward looking International company offering excellent career opportunities. We are situated in one of the most attractive parts of the country and are within easy reach of the motorway system, Gloucester and the Wye Valley. Salary levels and the working environment are excellent and the company offers generous relocation assistance where appropriate.

Apply giving details of your qualifications and experience to Mr. N. C. Abraham, Personnel Department, Rank Xerox Ltd., Mitcheldean, Gloucestershire GL17 0DD.

RANK XEROX
MANUFACTURING GROUP

25·1·79 15dp

SOFTWARE MANAGER

SELF-SERVICE TERMINALS

to £12,000

My client for this assignment, apart from being a noted manufacturer of mainframe hardware, is additionally a leading supplier of terminal devices for many purposes. Many of these terminals are produced for general marketing, whilst others are devised for individual client requirements. Increasingly, the emphasis is on customer operation.

To support this important and growing area of its business, the company has decided to establish a specialised software group, for which the staff and expenditure budgets increase steeply over the coming five years. The management has decided to make the appointment of Manager at this stage, in order that he/she may take immediate control of the existing embryonic group.

The requirements for this position are a sound technical background in terminal and/or communications software, coupled with demonstrable ability to lead a professional group of software technicians.

The software division is located in a beautiful part of the country and, if necessary, costs of relocation will be paid. Other benefits include a generous salary, superannuation scheme, Life assurance, etc.

Applicants should telephone A. P. BAKER on 01-499 4501 or send him a comprehensive C.V. at the address below quoting.

REF RW 50/1

A long-established manufacturer of computing equipment seeks a

SYSTEMS SUPPORT MANAGER

for its planned commercial systems marketing operation

This is a challenging appointment for an energetic hardworking systems support professional, who seeks an open-ended opportunity to make a major contribution to a significant new business venture. The company has an impressive growth record, and substantial technical and financial resources.

The job calls for a total commitment to the commercial mini-computer market, backed up by practical experience in the following areas:

1. Sales support
2. Disc-based commercial minis
3. Commercial applications
4. Communications protocols
5. Mini Operating Systems
6. Software Evaluation
7. Staff Management

Initially, the job will be heavily involved in determining the systems product and support strategy for the new venture. This will lead rapidly to building up and managing a very substantial department.

A comprehensive executive remuneration package will be offered, which will include a car, and will be in the region of:

£10,000

Contact A. P. BAKER on 01-499 4501 or write to him at the address given below, quoting

REF. RW50/5

SALES EXECUTIVES—SALES SUPPORT CONSULTANTS

Join in the success of this leading Mini-computer manufacturer

The company is a leading manufacturer of computing equipment. It has a specialist division for the marketing of its range of mini-computers and terminals, and this represents the fastest growing section of its business. In 1979 the size of the marketing force will be doubled.

The products are established and have enjoyed a very high level of market acceptance, being competitively priced and technologically advanced. The supporting software matches the standards of the hardware. Other elements of customer support — e.g. field engineering and demonstration/testing facilities — represent another strong point.

A large proportion of the sales is made through distributors and software houses. It is planned that sales through these outlets will be aggressively developed — in addition, of course, to increasing sales to large end users.

HUTCHINSON SCOGGINS has, therefore, been assigned to recruit both Sales Executives and Sales Support Consultants to handle the enormous demand. It is a situation which offers an exciting challenge in the short term, coupled with outstandingly good future prospects.

SALES EXECUTIVES

P.E. £15,000 upwards + Car

The front line jobs, for which sales experience is required.

In some instances, sales are made direct to large end-users, but, more often, the Sales Executive generates a high volume of sales by identifying and developing suitable systems houses — he is, therefore, something of an entrepreneur, and is rewarded for this talent.

Compensation is by way of high basic salary, commission drawn as appropriate and a very attractive commission scheme — this year no sales executive has failed to exceed his target. Additionally, there is an all expenses paid company car.

Call TONY BAKER (01-499 4501 office, 01-445 3512 home) **NOW.**

REF RW 50/3

SALES SUPPORT CONSULTANTS

c £8,000 + Car

Working closely with the Sales Executive, the Sales Support Consultant is the customer's source of detailed technical knowledge. So, in addition to being an authority on the products (for which proper training will be given) he/she will have the initiative to get rapid solutions to the practical problems which may arise.

Call TONY BAKER on 01-499 4501 (office) or 01-455 3512 (home) **NOW.**

REF RW 50/4

hutchinson-scoggins recruitment

47/48 New Bond Street *(entrance in Maddox Street)* London W1Y OHE Telephone 01-499 4501

SALES OPPORTUNITY

– with a difference!

The company is probably Europe's principal manufacturer of peripherals and terminals, having an enviable market base both here in the UK, and abroad. Growth continues apace, and generates an immediate requirement for additional sales executives to handle existing demand and, of course, to generate more.

With many of the big names on the customer list and an excellent product range—which is kept continually up-to-date—the newly restructured management team has every reason for its confidence in the future.

The vacant territories have good existing accounts and clearly identified potential. Targets are realistic.

The sales package consists of a base salary up to **£7,000,** a company car and a success-orientated commission plan to generate target earnings of

£12 - £14,000

Telephone TONY BAKER NOW on 01-499 4501

Ref: RW 50/2

REAL-TIME MINIS

Based in rural Berkshire, opportunities to enlarge your experience in state-of-the-art applications of minis.

★ £ NEG'L ★

(plus Relocation)

My client is a small systems house which specialises in the development of total systems based on **PDP/11** hardware under **RSX-11M.** Systems are developed in **RTL/2, Coral and Macro,** and increasing use is being made of **Intel 8085** microprocessors.

The company is young and small, so the working environment is congenial and stimulating. Your security is the financial backing and commitment of a major industrial concern. Your key to success will be your own talent and hard work.

There are openings at all skill-levels, and to reflect this, salaries up to and including **£7,000** will be paid in appropriate circumstances.

Please contact me, TONY BAKER, on 01-499 4501 (24 hour answering service) for an initial discussion.

Ref: RW 50/6

hutchinson-scoggins recruitment

47/48 New Bond Street *(entrance in Maddox Street)* London W1Y OHE Telephone 01-499 4501

PROFESSIONAL DP STAFF FOR THE MIDDLE EAST

We have been retained by several clients throughout the Middle East to assist in the recruitment of DP staff.

The main prerequisites for all applicants is a familiarity with IBM 360/370 equipment. All posts are offered on a one/two year renewable contract with annual salary reviews and excellent prospects for promotion. Fringe benefits include air-conditioned accommodation, free transport/car, leave paid back to the UK and Tax Free salaries starting at £8,000+ for the more junior positions. The salaries/benefits are dependent on the cost of living in the relevant country. There are excellent sports and social facilities within easy reach of all our clients' installations.

The posts are open to both male and female holders of UK passports. The technical requirements are varied and cover the following areas:

Analyst/Programmers and Systems Analysts for commercial/manufacturing applications in PL1/COBOL
Software programming support for OS based systems, and data base support for IMS
Engineering/Scientific support/development for a wide variety of technical staff using Fortran/PL1
Engineering/Sales support for Minis

Interviews will be held throughout December, January and February.

Ref: 50/1

INFORMATIX UNITED KINGDOM AND OVERSEAS INDEX

Haven Informatix Limited

24 Grays Inn Road London WC1X 8HR Telephone 01-831 6055 Telex 299539 HAVEN G

CAN YOU EARN TOP MARKS IN COMPUTER GRAPHICS SALES?

The computer graphics industry is growing rapidly. Ferranti Cetec is growing with it and we need the right quality of sales professionals to further our expansion.

GRAPHIC SALES ENGINEERS

You should be looking for a rewarding career in sales and marketing with a company offering future security and stability.

We are presently working in the forefront of technological advancement in interactive graphics, able to benefit from the strengths of the Ferranti Group while still enjoying the advantages of an independent company.

Vacancies exist in a number of key regions in the U.K. and further opportunities will be available in export at a later date.

Full product training will be given to suitable individuals. Benefits include very competitive salaries and company car.

Please write or telephone:

Ernest Barnard,
Personnel Manager,
FERRANTI CETEC GRAPHICS LIMITED,
Queen Elizabeth Avenue,
Hillington,
Glasgow, G52 4SN.
Tel: 041-882 3364

FERRANTI CETEC
Specialists in Computer Graphics

APPLICATIONS/SOFTWARE MANAGER

BRISTOL

Our Client Company, a rapidly expanding Software House specialising in the development of commercial 'on-line' turnkey systems for DEC PDP hardware, wish to recruit an extremely high level D.P. professional for the very important position of Systems/Software Manager.

Working in close liaison with the Technical Director, the appointed applicant will be expected to perform a vital role in the future development of the Company. Although having a wide range of executive responsibility, it is considered the predominant management need will encompass ultimate responsibility for project management, technical standards, budgetary control and the evaluation of software resources.

Although candidates with a level of expertise having already worked within a commercial mini environment would have an advantage, the important qualities needed for this position could equally be attributed to applicants whose previous experience may be entirely mainframe.

Applications for this post must be made in the first instance through Sanderson Executive; alternative sources will not be considered. For further information concerning salary, which will be circa £9,000 (incl.) + car, and conditions of employment, contact Keith Dawe at the address below either by telephone or letter.

Sanderson
EXECUTIVE RECRUITMENT 9A Princess Victoria Street
Clifton Bristol
TELEPHONE 0272 39302

Senior Computer Operator with large systems experience

£4,588 including shift allowance

We are Associated Container Transportation Services Limited and we operate world-wide through container services on behalf of five major shipping lines.

We have a newly installed B6700 computer with an on-line Database system to supplement and eventually replace our existing Honeywell 2060.

A vacancy has arisen for a Senior Operator to work with both of these installations in Southampton.

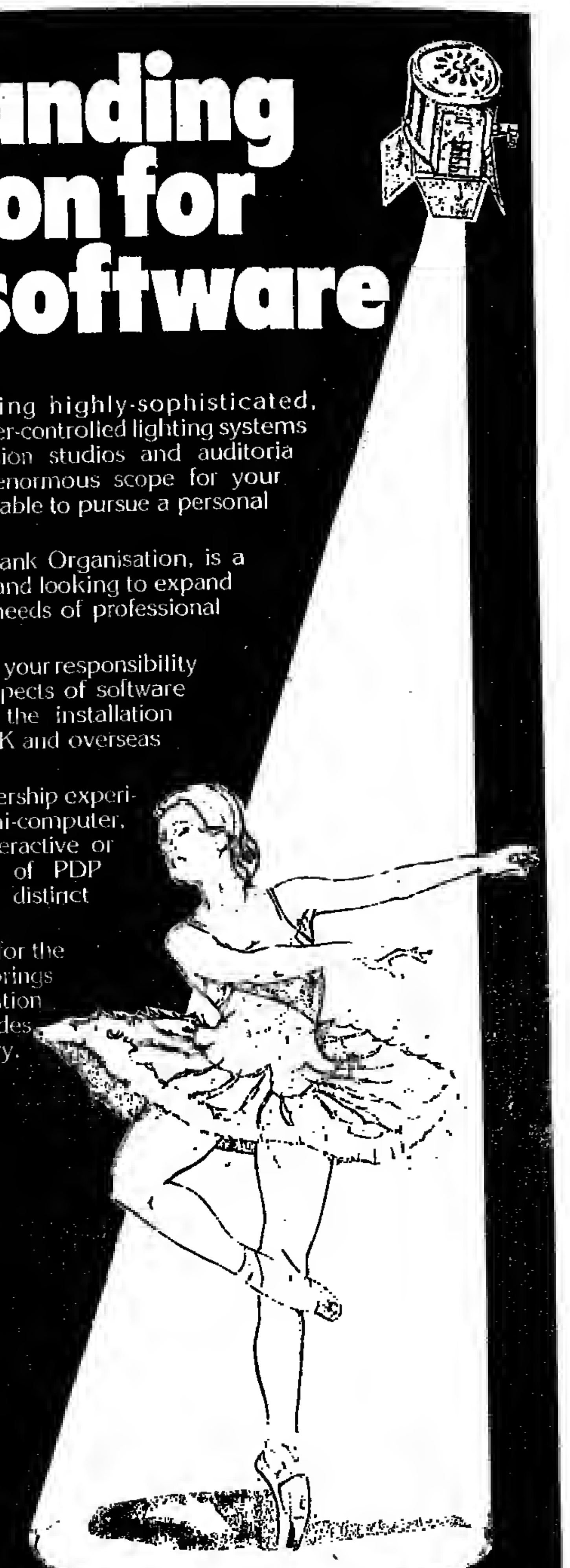
The job is a stimulating and challenging one and if you have at least 2 years' large systems experience, preferably with Burroughs equipment you could be well on the way to a new and rewarding career.

Our Southampton offices are modern and air-conditioned, and relocation expenses will be paid where appropriate.

The company offers, in addition to a salary of £4,588 including shift allowance, an attractive range of fringe benefits.

ACTS Please write or telephone for an application form to:
Mrs. L. Lieney, Assistant Personnel Officer,
A CT Services Ltd., Richmond House, Terminus Terrace,
Southampton. Telephone: (0703) 34433.

A demanding position for creative software skills



Designing highly-sophisticated, computer-controlled lighting systems for theatres, opera houses, television studios and auditoria throughout the world, you'll find enormous scope for your creative software talents while being able to pursue a personal interest in the Arts.

Rank Strand Electric, part of the Rank Organisation, is a world leader in this specialised field and looking to expand its software capability to meet the needs of professional lighting and audio applications.

As Senior Software Engineer it will be your responsibility to head a team involved with all aspects of software development projects through to the installation stage. This will entail travel in the UK and overseas to establish system requirements.

You should have previous team-leadership experience involving the development of mini-computer, multi or micro-processor-based interactive or real-time systems. A knowledge of PDP 11-based equipment would be a distinct advantage.

As well as a starting salary c£8,000 for the right man or woman, this position brings the comprehensive Rank Organisation benefits package which includes relocation assistance where necessary.

Please apply to Mr. C. Hough,
Personnel Manager,
Rank Audio Visual, P.O. Box 70,
Great West Road,
Brentford, Middlesex.
Tel: 01-568 9222

RANK STRAND

CHELSEA COLLEGE
University of London

SENIOR COMPUTER OPERATOR

(Two Shifts)

required to lead shifts operating local and remote batch services and multiple access interactive machines. The College Computer Centre operates a newly installed Harris 125 interactive computer for 18 terminals (the first in a UK university) under the VULCAN operating system. An Elliott 4130 mainframe computer with batch and up to 18 interactive terminals, front-ended by a PDP11/40 which also handles an RJE link to University of London COC computers, is the established service machine. Data communications are handled via a network controlled by the Gandell PACX3. A responsible and well educated person is sought with O-level Maths and English as minimum and preferably a technical background. Conditions of appointment include a 5-day week, 4 weeks' holiday, plus one week at both Christmas and Easter and salary to £4,600 inclusive.

Application forms and informal interviews by arrangement with Secretary, Computer Centre, Chelsea College (University of London), Pulton Place, Fulham Broadway, London SW6. Telephone: 736 1244.

GECO U.K.

GECO U.K. LIMITED serving the oil exploration industry has opened a new suite of offices and computer installation in Sidcup, Kent.

The Company invites applications from qualified and experienced

MAINTENANCE ENGINEERS

to maintain its hardware capability which consists of a Megaseis system with SEL CPU, CDC disc, FPS Array Processor, STC tape drives, Varian ES Plotter and ADDS terminals, together with a SCITEX laser plotter and HP mini computer.

The position offers excellent working conditions and growth opportunities for future advancement as planned expansion is rapidly being implemented.

Salary will be in the range of £6,500-£9,000 per annum, depending on experience and a company car could be provided to suitable applicants.

Please apply in the first instance to: **The Operations Manager**
GECO U.K. LIMITED
142/148 Main Road, Sidcup, Kent
Telephone: 01-302 3662

MYRIAD APPOINTMENTS LIMITED

Computer Personnel Consultants

OS COBOL

CROYDON **c £5500**

An opportunity has arisen to join the data processing division of a well known organisation in Croydon.

The company is expanding computing facilities and have many new projects planned for development and phased for implementation during 1979. In particular on-line systems will be extended to cover several new user areas.

The immediate requirement is for COBOL Programmers to augment the development teams. Ideally candidates will be able to offer around two years programming experience gained in an OS environment.

In addition to a very competitive salary the company are able to offer a comprehensive range of employee benefits.

Ref: SE1/1412

ANALYST/PROGRAMMERS

BUCKS
(20 miles from London)

JUNIOR to £5500
SENIOR to £6250

We are seeking PROGRAMMERS and ANALYST/PROGRAMMERS keen to take responsibility for system development and implementation. The Company offers.

- ★ Large IBM 370 installation
- ★ Gain DB experience
- ★ Develop On-Line Real Time Systems
- ★ Team Leading at the Senior Level
- ★ Analysis involvement at the Junior Level
- ★ 5 weeks' holiday
- ★ Rapid career progression

These vacancies are open to applicants with a minimum of 18 months COBOL at the junior level and 3 years' relevant DP experience at the Senior level

Ref: NW1/1412

COBOL OR ASSEMBLER

FULL TRAINING ON IBM 370

N.E. SURREY **TOTAL TO £6400**

PROGRAMMERS with at least two years COBOL or ASSEMBLER, wishing to develop their careers within a major British company, will receive full training in appropriate areas. The data processing department ensures all programmers have the opportunity to learn a second language and that IMS OS JCL is fully explained. Teleprocessing and database techniques are incorporated in certain systems with all new development being in COBOL.

Operating the latest IBM equipment, our client pursues a policy of internal promotion thus affording successful candidates a progressive career path. Excellent working conditions are enhanced by a really impressive benefits package and the office is well served by public transport (car parking available). There is a free canteen in the building and full flexitime is in operation.

Ref: S1/1412

WHY COMMUTE?

BEDFORDSHIRE **£4500-£6500**

Our client is a well established manufacturing company with a multi-million pound turnover and is keen to re-invest profits in modern technology and manpower.

Contributing to the successful growth rate of the company is an enterprising Data Processing department servicing both line management and manufacturing operations. The installation comprises a large IBM 370 mainframe being run under DOS/VS using CICS for on-line processing.

In order to keep pace with planned new projects there is a requirement for several programmers and analyst/programmers with varying levels of proficiency using COBOL.

This is an excellent opportunity to join a young and dynamic team where every opportunity will be offered to progress your career.

Ref: N1/1412

24-hour answering service
Please telephone for a confidential discussion or write to:
30 Fleet Street London EC4Y 1AA
01-353 0981

PROGRAMMERS, ANALYSTS CONSULTANTS

£4500 to £8000

Unilever Computer Services Ltd is a member of the Unilever group of companies, and is one of the largest and most successful computer service operations in the U.K. with activities ranging from bureau services through microprocessor systems to computerised information services. Our bureau service is based on several large I.B.M. compatible mainframes and operates a sophisticated telecommunications network within the U.K. and Europe.

INFORMATION SYSTEMS

Analyst/Programmer £6000-£7000

To project lead application systems development involving teams of up to 5 programmers, using interactive database technology. The successful applicant will be a graduate with at least 3 years relevant experience. The ability to communicate effectively with clients and to undertake systems analysis, design and specification is essential.

Programmer £4000-£5,500

To take part in application systems development. Applicants should have at least one year experience, preferably in an IBM environment, programming in FORTRAN or PL/I. A degree in an engineering, scientific or mathematical discipline is essential.

UCSL

CONTACT:
John Warren
UCSL, Station House
Harrow Road, Wembley, Middx. HA9 6EB

The engineering region within UCSL is a separate marketing group with responsibility for servicing the requirements of the oil, petro-chemical, construction and allied industries. Our support teams provide a high calibre consultancy and development service to these industries, both in information and technical systems. Our application areas range through project management, cost control, materials control and manpower planning to pipe stressing and structural analysis.

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Technical Consultant £6500-£8,000

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This is a key role within the European Customer Service Organisation based at Wokingham. It involves travel throughout Europe providing high level technical support to local field service engineers. The job demands the ability to fault find down to chip level and additionally the co-ordination/dissemination of information between the US and Europe. It will attract someone who has about four years experience of support engineering on mainframe or mini systems, who enjoys trouble-shooting and would welcome the opportunity to travel.

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to £8,000 p.a. basic

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MODCOMP

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Write for further details and application forms to: R. J. Moffet, Esq., Assistant Personnel Manager, Tullis Russell Company Limited, Auchmuty & Rothes Paper Mills.

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Telephone Glenrothes (0592) 753311

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To £5,500
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- **HIGH LEVEL LANGUAGES**
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Knowledge of either PL1, ALGOL 68, BCPL or CORAL and at least one realtime-operating-system would be of advantage.

An excellent salary and fringe benefits will be part of the contract offered to the successful applicant.

Further conditions will be discussed during interviews which will be held in London in January 1979.

Please apply referring to this advert with full curriculum vitae to:

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Further particulars may be obtained by writing to the Assistant Registrar, Faculty of Science and Engineering, The University of Birmingham, P.O. Box 363, Birmingham B15 2TT, to whom applications (three copies) including full curriculum vitae and naming three referees should be sent by Friday 5th January 1979.
Please quote ref. [illegible]

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The programmers appointed will work in small teams on Development projects using a range of in-house computers. Promotion prospects are excellent as it is anticipated that continuing expansion will create additional Senior level positions in the future.

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or telephone Tewkesbury 294161 for more information.

[illegible]

THE COLNE VALLEY WATER COMPANY

PROGRAMMER

Grade 5 (£4,760-£5,087)
(Inclusive of £312 supplement and £125 London Weighting allowance)

The Colne Valley Water Company supplies water in Hertfordshire and North West London to a population of 760,000 with 300,000 accounts. The Company operates an ICL 2904 with DDE EDS 60 and tape drives.

Applicants should have 2 years' experience of COBOL preferably using disc based systems. A knowledge of PLAN would be an advantage.

This is a good opportunity to join a small team who will be closely involved in developing and improving new systems for collection of water charges and all aspects of accounting and water statistics.

The appointment is within the Water Industry National Joint Council scales and conditions of service. There is a 35 hour week. Contributory Pension Scheme and holiday entitlements fully transferable with local government and public boards. Staff restaurant. Mortgage facilities and assistance with relocation expenses will be provided in appropriate cases.

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c. £3,900

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The position, which may be of interest to someone with around one year's experience in a data processing environment, involves working as support liaison between systems and operating staff in the implementation of new systems or modification of existing systems. The Operations Planner will also be responsible for providing a testing facility to user departments whilst ensuring complete data integrity.

Experience in DOS/POWER job control language would be valuable.

Benefits, including the advantages of flexitime, are those you would expect from a large company. If you are interested in the position please phone for an application form:

Susan Turner,
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260 Bath Road, Slough, Berks.
Tel: Slough 31234 Extn. 446.

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UMIST
COMPUTER OFFICER

The SRC has supported a major project in the Department of Chemical Engineering Separation Processes Laboratory for a number of years. This active research group uses a large PDP 11/40 disk based system to perform real-time data logging and control tasks in connection with its extensive pilot plant distillation and absorption equipment. Existing systems programs are written in PAL 11 assembler and the group wishes to take advantage of high level language techniques so as to facilitate maintenance and expansion of the system. The successful candidate will be closely involved with members of academic staff in integrating new programs with the existing assembly language programs whilst maintaining the plant in operation. In addition he or she will be expected to assume day-to-day responsibility for the software maintenance and routine operation of the computer system and its programs.

Experience of mini-computers and their operating systems in a real-time environment is essential; experience with a PDP 11 and PAL 11 would be an advantage. Knowledge of a high level language (e.g. Fortran, Algol, Coral, RTL2) is desirable.

The Appointment will be for two years in the first instance. Salary on a scale of £3864-£6604 (per annum) or £3883-£6555 (per annum) depending on age, experience and qualifications.

Applications may be made either on forms available from the Registrar, UMIST, PO BOX 88, Manchester M60 1QD, or by letter stating details of age, qualifications, experience, current position and salary.

Please quote reference CE/177.

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Covering a wide range of subjects, our training staff fall into two main categories.

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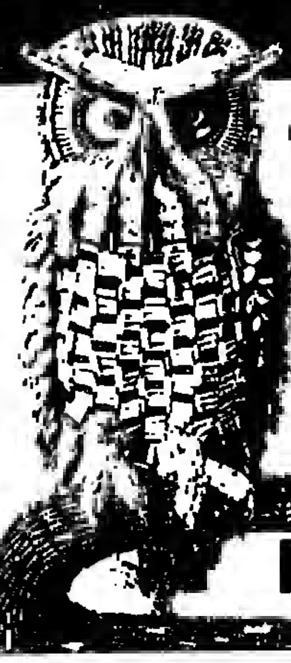
Please telephone or write for an application form to Rick Phillips, Director of Education, Kings House, 174 Hammersmith Road, London W6. Tel: 01 748 4191



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TECHNICAL SUPPORT STAFF

LEICESTER BUILDING SOCIETY OADBY, LEICESTER

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The main requirement will be to ensure the successful implementation of the Data Base and Data Communications network, and monitor the performance of computer systems.

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Salary will very much depend on the experience and expertise that can be offered.

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APPLICANTS SHOULD STATE PERSONAL DETAILS, CAREER HISTORY AND PRESENT SALARY, IN WRITING TO: ASSISTANT PERSONNEL MANAGER, CHIEF OFFICE, LEICESTER BUILDING SOCIETY, OADBY, LEICESTER LE2 2PF.

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Write quoting ref. 10.38 for further details and application form, posting first-class to: Appointments Officer, Middlesex Polytechnic, Bounds Green Road, London N11 2NQ. Closing date 3 January.

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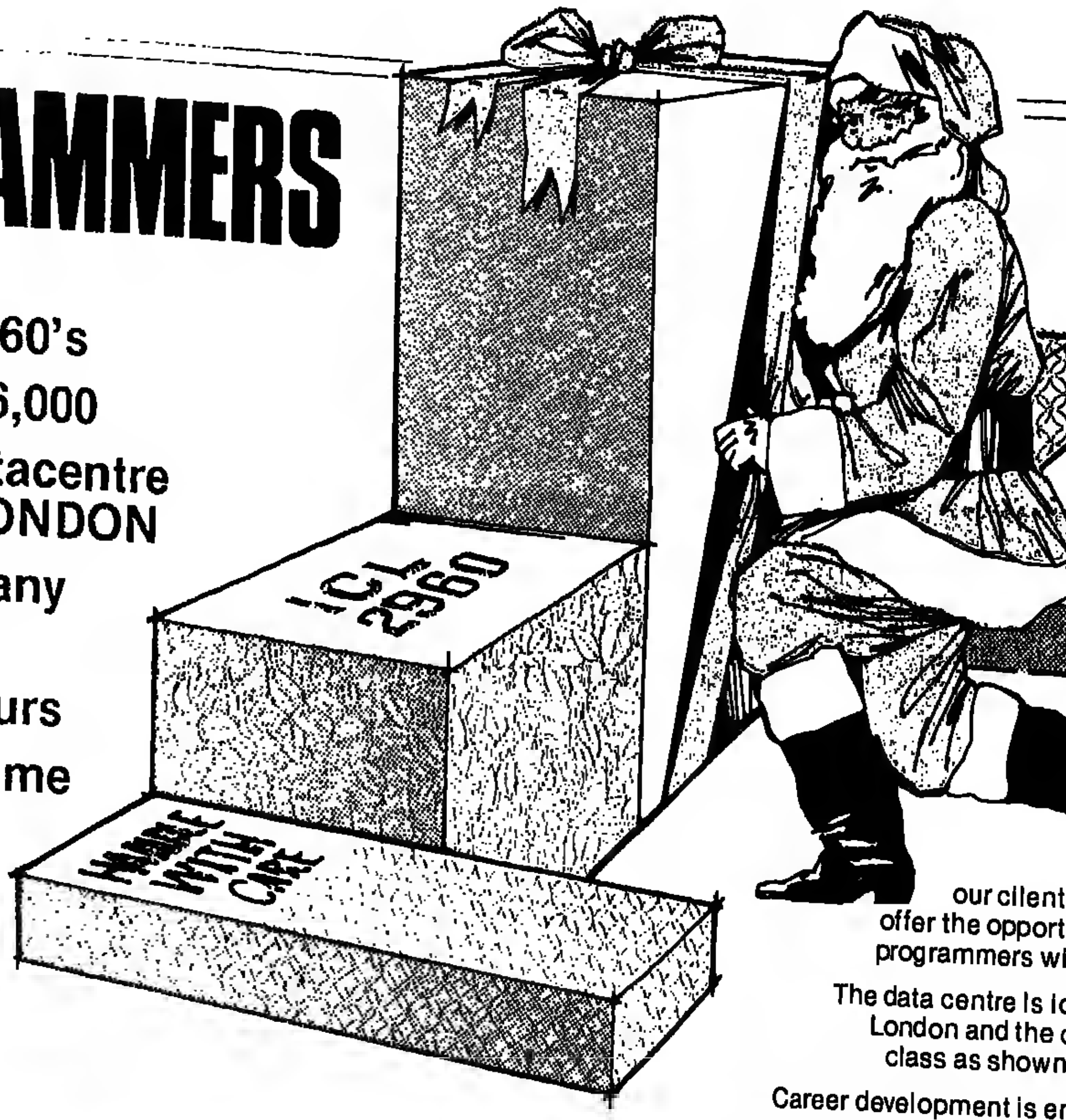

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The applicant should have [illegible] and the ability to [illegible]. Shift work and overtime [illegible]

These jobs are [illegible] of the [illegible] in the near future.

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£4017/£4431 inclusive

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For Area A, Spanish or knowledge of some other Latin language would be particularly useful, but not mandatory.

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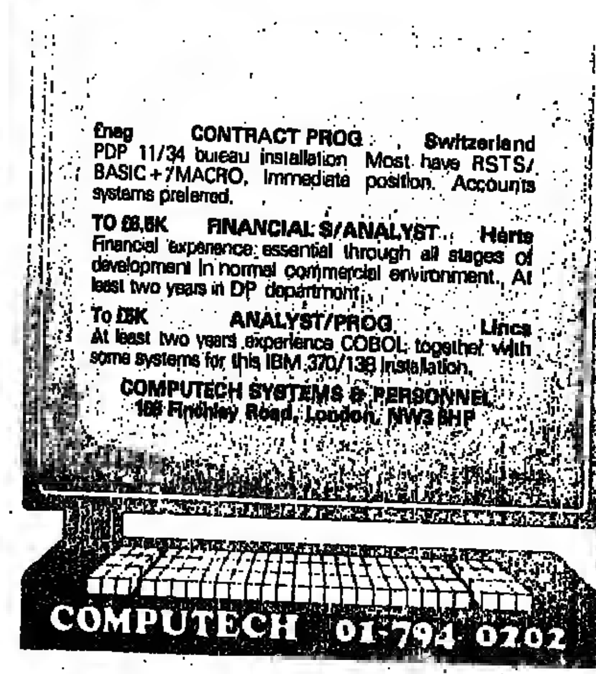
Please ring us for a confidential discussion, quoting ref. 970, or leave a message on our answering machine after hours and we'll contact you.

EDP SYSTEMS 01.637 5796
52-53 Margaret St. London W1N 7FF



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Financial experience essential through all stages of development in normal commercial environment. At least two years in DP department.

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COMPUTECH 01-794 0202

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The applicant will be expected to operate a Hewlett Packard 2000 F computer, and the R.J.E. link to the Manchester University Regional Computer.

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Application forms are available from: **Anne Brian, Manchester Business School, Administrative and Purchasing Officer, Booth Street West, MANCHESTER M15 6PB.**

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IBM 370/135 £4,500 OP
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City + Mortgage
Our client, a major Insurance Company, is seeking programmers with approximately three years' experience on ICL Hardware. Any experience gained in a supervisory capacity would be a distinct advantage.

An excellent starting salary is coupled with an attractive benefits package which includes Season Ticket Loans, Car Purchase Scheme and a Subsidised Mortgage. Ref. 680.

STAFFSCENE 24 hrs. answering service
COMPUTER RECRUITMENT DIVISION **01-734 5202**
70 BREWER ST., LONDON, W1

County Treasury

Opportunities in Nottinghamshire

Junior Analyst up to £6,000
Senior Programmer up to £5,500
Programmer up to £4,500

The Computer Centre is housed in a modern purpose-built block conveniently sited on the bank of the river near Trent Bridge. Nottinghamshire has established a joint County/Districts computing service of substantial proportions based on ICL processors (96K 1903T and 160K 1904S). There are 20 links to District Councils and to County Council Departments for interactive use and for RJE. Programming staff (male or female) are currently involved in the provision of advanced facilities for established systems and in the implementation of new systems for user departments. Programmers are expected to have a qualification in Computer Studies or experience in the use of COBOL. Applicants for the Junior Analyst post must have a sound programming background and an enthusiasm for systems work.

Generous assistance will be given with the expenses incurred in moving house in accordance with the Authority's scheme.

Contact the Computer Systems Manager, Peter Carrington, if you wish to discuss these posts or to receive an application form. (Tel: Nottingham 863366 ext.3510.)

Nottinghamshire County Council
County Hall West Bridgford
Nottingham NG2 7QP

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servelec ANALYST/PROGRAMMERS TO £6,500 + BONUS

We are a young, expanding Computer systems house with a solid client base, involved in micro/minicomputer based automation/control systems.

We are establishing project teams and require analyst/programmers with the following qualifications:
- 1-3 years' programming experience, including assembler language
- Ability to understand hardware
- Problem solving capability
- Professional outlook and ability to communicate

We offer rapid career development with regular salary reviews, staff pension and insurance schemes, together with all the usual company benefits.

CALL OR WRITE TODAY: John Archer SERVELEC COMPUTER SYSTEMS LTD., Churchill House, Talbot Road, Old Trafford, Manchester M16 0PQ. Telephone (061) 872 0280 or Wilmslow 531418 (evenings).

RPG11 — up to £6,000
in Baker Street, W.1

Training given in on-line techniques and system design to programmers with key entry ability. Friendly office with free food and flexible hours in entertainment and shopping area.

Ring: 01-487 4413

NORTH YORKSHIRE COUNTY COUNCIL

Require computer personnel with the necessary experience and drive to join an energetic team of computer professionals engaged in developing applications for a large ICL 2976 computer providing comprehensive Batch, RJE, MAC and TP facilities for a variety of users under VME/B

ASSISTANT COMPUTER SERVICES MANAGER (DEVELOPMENT)
SALARY £6,513-£7,230

Applicants should have 7 years' computer experience including at least 3 years' experience as a senior project leader responsible for a number of successful projects and proven staff responsibilities.
The successful applicant will be a member of the Computer Services senior management responsible for the support, enhancement and development of systems. Initial responsibilities will include control of the transition to 2900

PROJECT LEADERS
SALARY £5,727-£6,342

Applicants should have at least 5 years' experience including responsibility for projects through from specification and design to successful implementation. Experience of the non-financial area (e.g. Highways, Planning, Statistical) would be an advantage

SYSTEMS PROGRAMMER — VME/B
SALARY £4,245 - £5,073

A vacancy exists within the software support team responsible for the implementation and maintenance of VME/B and associated superstructure products.
Applicants must have experience of large operating systems, preferably VME/B or George 3

SYSTEMS ANALYST/PROGRAMMERS — DEVELOPMENT SALARY £4,245 - £5,073

Vacancies exist within the project teams engaged on transition to the 2900 and subsequently the support, enhancement of current applications and development of interesting new applications.
Applicants should have experience of COBOL and a working knowledge of a sophisticated operating system.
Experience of systems analysis will be an advantage

STARTING SALARIES WILL BE PAID ACCORDING TO EXPERIENCE
The Council will pay removal expenses, assistance with legal fees, disturbance allowance, and lodging allowance where appropriate.
If you consider your experience and ability to be suitable, then write giving full details, together with the names of two referees to THE COUNTY TREASURER, COUNTY HALL, NORTHALLERTON, NORTH YORKSHIRE, DL7 8AL. TELEPHONE (0609) 3123, EXT. 515
APPLICATIONS TO BE RECEIVED BY 19th DECEMBER, 1978

OPERATORS

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ALL INSTALLATIONS IN LONDON AND HOME COUNTIES

IBM	DOS	OPS ANAL	5YR	£6000	E. LONDON
IBM	DOS	SHIFT LDR	5YR	£6300	C. LONDON
IBM	OS	SHIFT SVR	4YR	£5200	C. LONDON
IBM	DOS	SNR OP	2YR	£4400	E. LONDON
IBM	DOS	OPERATORS	1YR	£4200	E. LONDON
IBM	OS	OPERATORS	1YR	£4200	E. LONDON
IBM	OS	OPERATORS	1YR	£4200	W. LONDON
ICL	GII/III	OPS/SHIFT LDRS	1YR+	£6000c	W. LONDON
ICL	2900	OPERATORS	1YR	£4300	E. LONDON
ICL	GII	SNR OP	2 YR	£4500	C. LONDON
ICL	GII	OPERATORS	1YR	£4000c	ALL AREAS
ICL	GIII	OPERATORS	1YR	£4300	W. LONDON
UNIVAC	ANY	OPERATORS	1YR	£4500	W. LONDON
DEC	PDP	OPERATORS	1YR	£4200	C. LONDON
NCR	ANY	OPERATORS	1YR	£4500	C. LONDON
IBM	ANY	SNR SYS CNTRL	4YR	£6000	C. LONDON

DATA CONTROLLERS — WE HAVE MANY VACANCIES IN ALL AREAS, £3000-£5000

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3 LIVERPOOL STREET
LONDON EC2M 7NH
01-283 2751

UNIVERSITY OF LEICESTER
X-RAY ASTRONOMY GROUP

COMPUTER OFFICER

to work on the UK-6 and HEAO-B satellite projects in the X-Ray Astronomy Group. The successful candidate will be required to take responsibility for the operation of the Data Terminal and to assist with writing and maintenance of data analysis software for both UK-6 and HEAO-B projects. Candidates should be graduates in Physics or Astrophysics, with experience of computer programming/Operations (particularly with PDP-11 systems).
The appointment is until December, 1981 (subject to satisfactory completion of a one year probationary period), at a salary on the Research Assistant range 1B £3,384-£4,882.

Applications in writing, with full curriculum vitae and names of two referees, to Professor K. A. Pounds, Department of Physics, Leicester University, University Road, Leicester LE1 7RH, by 5th January, 1979.

PROGRAMMERS SENIOR PROGRAMMERS SYSTEMS PROGRAMMERS
(Scientific)

Long Contracts in France/Switzerland £12,500-£20,000 p.a.

BENNEY ELECTRONICS LTD
Ferndown Ind Est, Dorset
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Contact Jim Taylor
ANGLIAN D.P. SERVICES LIMITED
Danbury 4255 (STD 02454)

THE UNIVERSITY OF SHEFFIELD

PROGRAMMER

Applications are invited from men and women for a post of PROGRAMMER in the University Computing Services. The work will involve the writing of programs and provision of program assistance for computer users throughout the University. The post might suit a recent graduate in Computer Science or in a related subject. Candidates should have an interest in programming in a high level language, and a willingness to specialise in an area such as data bases, graphics, statistics or scientific programming. Salary according to qualifications and experience on the Other Related Staff Grade 1B salary scale £3384-£4882. Particulars from the Registrar and Secretary, The University, Sheffield S10 2TN, to whom applications should be sent by 2 January, 1979.
Quote ref. R233/BB

CENTRAL ELECTRICITY RESEARCH LABORATORIES
Kelvin Avenue, Leatherhead, Surrey, KT22 7SE.

RESEARCH OFFICER
Micro and Minicomputer Software

A vacancy exists within the Control and Instrumentation Systems Analysis Group of the Control & Instrumentation Technology Section for a graduate who will be required to work as part of the project team engaged in research and development into real-time process control techniques. In particular the work is concerned with hierarchical and distributed microcomputer systems and involves the development of software techniques to ensure the proper utilisation of such systems, the assessment and improvement of software reliability and the development of computer-aided design methods.

Applicants should be qualified to at least a good honours degree level and ideally a person who would enjoy working within a highly motivated and successful team is being sought.

The Laboratories are situated in a pleasant part of Surrey and offer attractive Conditions of Service and facilities for the total of 800 Research and Support Staff engaged in a broad spectrum of research into the materials, technologies and plant performance problems of the Central Electricity Generating Board.

Depending upon age, experience and qualifications the appointment will be made within incremental salary ranges to £5375 or £7050 plus a Self-Financing Productivity Scheme payment ranging between £9 and £17 per month.

Application forms may be obtained from the Head of Personnel Development & Services, Central Electricity Research Laboratories at the above address or telephone Leatherhead 74488 Ext 363 quoting reference number RL/115/CW. Closing date is **Friday 29 December 1978.**

WILLESDEN COLLEGE OF TECHNOLOGY

LECTURER I IN COMPUTING

A **TEMPORARY** one-term appointment running from 5th January to 30th March inclusive is offered for a Lecturer I post to teach **COMPUTER SCIENCE** to A-level and City & Guilds courses. It is expected that during this term a full-time **LECTURER II** post to teach mainly **COMPUTER SCIENCE** will be advertised.

Application forms may be obtained from The Registrar, Willesden College of Technology, Denzil Road, London NW10 2XD, or Tel: 01-459 0147, to be returned as soon as possible.

Midlothian District Council

PROGRAMMER

Post No. 8/25
Salary Scale £3501-£4773
(inclusive of supplement)

The District Council currently operates an ICL 2903 Model 20 Computer and a vacancy has arisen for a trained Programmer to assist in the development of new applications and the maintenance of existing programmes. Current applications are financial, but will be extended to include other services provided by the Council in due course. The opportunity will be given to gain experience in systems analysis and design.

Applicants with a thorough knowledge of Cobol and preferably a working knowledge of RPG should have other relevant experience or a Diploma in Computer Studies or equivalent. Placing on the above Salary Scale will be according to qualifications and experience.

Application forms obtainable from the Personnel Officer, Midlothian District Council, Eskdaill Court, Dalkeith EH22 1AQ, to whom they should be returned by 8th January, 1979.

PROGRAMMERS/ANALYSTS

Why not leave the rat race and head for the beautiful West Country. The scenery is marvellous, the pace is slower and the salaries are very attractive.
At the present time we have vacancies for:
IBM & ICL PROGRAMMERS (at least two years' experience)
MINI-COMPUTER PROGRAMMERS (at least two years' experience)
TRAINEE SYSTEMS ANALYST (at least two years' programming experience)
ANALYST/PROGRAMMER (at least four years' experience)
For these vacancies and other general enquiries please contact Tom Whiston, Executive Consultant, WESTERN STAFF SERVICES, 83 The Promenade, Cheltenham, Glos. Tel. 0242 37776/7/8.

FACILITIES MANAGEMENT BUSINESS SYSTEMS CONTRACT STAFF SUPPORT RECRUITMENT CONSULTANCY
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CONTRACT STAFF SUPPORT RECRUITMENT CONSULTANCY BUSINESS SYSTEMS SOFTWARE PACKAGES

IS YOUR JOB GETTING SMALLER?
OR HAVE YOU OUTGROWN IT?

Our client is a major electrical and electronic manufacturing group based in the Northern Home Counties, within easy reach of London. The systems and programming area is expanding again in order to keep pace with the ever-increasing growth of this successful and well-established company. Consequently, first career opportunities are being offered to systems analysts and senior programmers who wish to become analysts. There are also two vacancies for programmers who wish to further their technical support experience or move into that specialised area.

SYSTEMS ANALYSTS c. £6,850 p.a.

Applications are invited from analysts, senior programmers and graduates with a sound programming background and the ability to specify programs. This position will involve systems design work.

TECHNICAL SUPPORT PROGRAMMERS c. £6,000 p.a.

Applications are invited from conscientious programmers with a minimum of one year's programming experience using PLAN. A knowledge of COBOL is desirable but not essential.

Successful applicants will have the opportunity to further their technical experience, joining a small, friendly and yet highly professional team involved in a wide range of applications including the development of personnel and nominal ledger systems. This company has a policy whereby promotions are made from within wherever possible. Benefits are excellent and include 5 weeks' holiday after 3 years' service.

Further information and an application form contact Hexagon, Ref PJ 78590

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computer services
1-5 WARDOUR STREET LONDON W1V 3TB
TEL 01-439 3671

PROGRAMMER/ANALYSTS
YOUR CHANCE TO EARN OVER £4,500

GRADE AP4, SALARY £4530-£4917 p.a. inclusive

We are looking for a Programmer/Analyst with two to three years' experience in COBOL and FORTRAN interested in working on advanced management information systems and computer aided design.

These systems are being developed on a range of machines, from main frame through time sharing to minis.

The person we are looking for should have relevant qualifications and be able to work with the minimum of supervision. Experience of data-base management systems would be an advantage but is not essential. The post will probably be attractive to a Programmer who wishes to move into Systems Analysis.

A 36-hour week is worked over a 9 day fortnight of 4 or 4½ day week with flexible starting and finishing times.

Hillingdon is situated to the west of Greater London, borders on Bucks and Herts yet offers easy access to Central London. One-third of its 42 square miles is Green Belt.

LONDON BOROUGH OF HILLINGDON

Application form from the Personnel Officer, quoting reference A/51/15X, Civic Centre, Uxbridge, Middlesex, UB8 1UW. Telephone Uxbridge 50566. Closing date: January 5, 1979.

NEW YEAR PROSPECTS LOOKING DULL?
Try tackling a new job in

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How about these prospects?

Programmers (Norwich) — with experience of COBOL, Assembler &/or PL/1	£3,500-£4,725
Programmers (Essex) — with 1 yr + experience of COBOL	£3,500-£6,000
Sen. Progs. (S. Essex) — with 5 yrs + experience of COBOL	£6,000-£7,000
Syst. Anals. (Norwich) — with experience on IBM or ICL	£4,500-£6,000
Syst. Anals. (Essex) — experience on IBM, ICL or Honeywell	£6,000-£7,000

Contact Karen Burdon on 024541 4255 or write to Anglian D.P. Services Ltd., Stratford House, Maldon Road, Danbury, Chelmsford, Essex CM3 4QW.

ANGLIAN D.P. SERVICES LTD.

A leading British Computer Manufacturer in Northern Home Counties is seeking a

COMPUTER COMMUNICATIONS SPECIALIST
c£10,000

This key appointment requires proven up-to-date knowledge of current trends in communication techniques. Candidates must be familiar with Communication Software and protocol and have a full understanding of Post Office requirements.
The successful candidate will be an important member of the technical team and will be able to make a major contribution to Company Policy in the fields of Product and System Development.

Please send full details mentioning Ref. D.P. to
Michael Rhodes, Executive Dynamics
MANAGEMENT SEARCH & SELECTION CONSULTANTS
23a High Street, Hemel Hempstead, Herts.
Tel. 0442-62633

The vacancy is open to male and female applicants. No details will be passed to our client without prior permission.

UNIVERSITY OF GLASGOW

LECTURESHIP IN COMPUTING SCIENCE

Applications are invited for the post of Lecturer in the Department of Computing Science. Applications from well-qualified candidates in all areas will be considered but preference will be given to those with an interest in the design of microprocessor systems, or in teaching systems analysis and business applications of computers.

Salary will be within the range £3883-£5804 of the Lecturers' scale £3883-£7754 (interim), with placement according to age, qualifications and experience.

Further particulars may be obtained from the Secretary of the University Court (Room 18), University of Glasgow, Glasgow G12 8QQ, to whom applications (8 copies), giving the names and addresses of three referees, should be sent not later than 5th January, 1979.

In reply please quote Ref. No. 4328 GP.

UNIVERSITY OF SURREY
DEPARTMENT OF PHYSICS

RESEARCH COMPUTING ASSISTANT

Applications are invited for the post of Computing Assistant to participate in two research projects which are concerned respectively with examples of the behaviour of gases in the Kinetic regime and with the attenuation of x-rays in various materials. No special knowledge of the relevant physics is required but mathematical and computational expertise is necessary. Experience of data processing with mini computers would be very valuable. Knowledge of FORTRAN is essential and a knowledge of another high level language would be useful.

The person appointed will work in a small team of computing staff supporting teaching and research in the physics department. The post is available for two years and the appointment will be made on a salary range of £3384-£4382 depending on age and experience. Half-time appointment would be considered.

Applications, including the names of two referees, should be sent by January 5th, 1979, to the Assistant Secretary (L.P.G.), University of Surrey, Guildford, Surrey.

UNIVERSITY OF LONDON COMPUTER CENTRE

The University of London Computer Centre provides a regional computer service to the University of London and to Universities in the South East and South West of England. The Centre is currently equipped with Control Data 7600, 6600 and CYBER 72 computers and supports a large communications network of over 50 remote batch terminals and 96 keyboard terminals.
An exciting programme of development is planned which will include substantial replacement of the existing equipment in the early 1980s.
Applications are invited for the post of

COMPUTER INSTRUCTOR

The job involves the organisation and monitoring of all aspects of training for Computer Operations staff. It also involves the preparation and presentation of training material where appropriate, and there is considerable scope in this area for the creation of new training courses. There will also be some involvement in certain aspects of the day-to-day functions of the Operations Department.
Applicants should have a Degree or equivalent qualification, but suitable experience in computer work and/or technical instruction would also be acceptable. Salary will be in the range £3384 to £5895 (under review) plus London Allowance.
The Centre offers excellent conditions of service and operates the Universities Superannuation Scheme.

Further details and application form are available from the [illegible] Secretary, ULCC, 20 [illegible], London WC1N [illegible]. Telephone: 01-[illegible]. Applications close 29th December, 1978.

INSTITUTE OF HYDROLOGY

SCIENTIFIC OFFICER/HIGHER SCIENTIFIC OFFICER
SOIL MOISTURE DEFICIT DATA BANK

We have a vacancy for a person who will be responsible for the compilation of a soil moisture data bank. The person appointed will contact and visit UK organisations who regularly use neutron probes to monitor soil water profiles. Those with suitable soil moisture data will be invited to contribute to a central data bank at the Institute. The appointee will classify, compile and quality control the Data, maintain liaison and produce comparisons between measured soil moisture deficits and deficits predicted from meteorological data. Relevant factors will include vegetation/crop, soil properties and depth of water table.

Qualifications

A good degree in a relevant field such as agricultural science, soil science or environmental science. A knowledge of basic soil physics is required and knowledge of basic statistics, computer programming, plant/soil water relations and experience with neutron probes would be an advantage. For Higher Scientific Officer grade at least two years postgraduate experience in a relevant subject. An ability to get on well with people is essential. The appointment will involve travelling within the UK and a driving licence is required.

Salary and Conditions

The appointment will be to the Scientific Officer or Higher Scientific Officer grade. Starting salary will depend on age and experience but will be within the following scales

Scientific Officer
£2839-£4416, 20 days paid annual leave in all cases
Higher Scientific Officer
£4101-£5488, 22 days paid annual leave in all cases
There is a non-contributory superannuation scheme

Staff of the NERC are not Civil Servants but their pay and conditions of service are similar to those of the Civil Service

The Institute is situated in pleasant rural surroundings and has a staff restaurant, an active Sports and Social Club and a flexible working hours scheme. Write for application forms quoting reference E2/1/107 to

Institute of Hydrology
Maclean Building
Crowmarsh Gifford, Wallingford, Oxon OX10 8BB

Closing date for applications 4th January, 1979

NATURAL ENVIRONMENT RESEARCH COUNCIL

ST. BARTHOLOMEW'S HOSPITAL
London EC1A 7BE

Programmer

Applications are invited for a Programmer to work on a variety of applications of minicomputers in a newly reorganised section of Scientific Computing and Statistics. Previous experience of FORTRAN programming is desirable. Starting salary £3,806 rising by annual increments to £4,775 p.a.

For an application form please telephone 01-600 9000 ext. 2271 quoting ref. BCA/281. Closing date for completed forms: 5th January, 1979.

SWINDON

SENIOR SYSTEMS ANALYST

New projects **From £6,500**

Our clients have asked us to recruit a mature, experienced Senior Systems Analyst, probably with upwards of eight years computing experience. The job offers:

- plenty of development work (mainly management information, accounting and financial systems at present).
- the stimulation of occasional visits to other user locations in the UK.
- leadership of one or more project teams of analysts and programmers.
- the use of both mainframe and minicomputer hardware, including communications and on-line systems.
- close involvement with positive line managers.

This opportunity will interest experienced analysts who are looking for a long-term career opening in a large successful Company with over ten years commitment to the use of major computing systems.

Please ring us for an exchange of information, quoting ref. 968. Alternatively, leave a message on our answering machine after hours and we'll contact you.

EDP SYSTEMS 01.637 5796
52-53 Margaret St. London W1N 7FF

Programmers

with Assembler experience

You are probably a Graduate with 1-3 years programming experience which may have included real time, PDP 8, small message switching systems or control systems. You are now looking to extend your experience in a more challenging stimulating environment with regular hands on activity on a wide variety of short-term real time projects which will afford you an all-round expertise.

We are The Data Systems Division of ITT, engaged in the manufacture and market of computer-based message switching systems. Our well established product range is in demand and has gained tremendous ground in this extremely competitive field. Right now we are preparing to cope with demands for systems and *facilities and this creates new opportunities* for ambitious people in the general field of message switching.

We offer The chance to improve your knowledge and familiarity with real time on a variety of short-term products, the opportunity to become totally involved from inception to completion with as much client contact as you desire, professional responsibility for each project and real prospects of career advancement within the message-switching sphere.

There may be some opportunity for UK and European travel, salaries and benefits will be highly competitive and fully reflect our position in the market.

To find out more about these opportunities please telephone Mrs F Mason, on 01-440 4141 ext 349 for an application form or write to Personnel Department, Data Systems Division, *ITT Business Systems, Dvoracy House,* 1a Chalk Lane, Cockfosters Road, Barnet, Hertfordshire EN4 ADO

ITT Business Systems ITT

MILFORD HAVEN REFINERY

If you have a degree or equivalent in electronic or electrical engineering, and have obtained solid experience in electronic instrumentation, computer system hardware and software, and interfacing computers with instrument peripherals, we would like to meet you. Specifically we are looking for a

DIGITAL SYSTEMS ENGINEER

to join a small team engaged in the design, development, start-up and operation of the process control computer systems at the refinery.

During the project engineering phase the successful candidate will monitor the computer vendor's *design and manufacturing activities; interpret the refinery's system requirements to the vendor;* check the full system at the vendor's plant prior to shipment, including the system software; and monitor the computer installation and start-up.

Following start-up, the Digital Systems Engineer will be responsible for computer system troubleshooting, providing a software consultation service for Applications Engineers and for the ongoing development of the system.

The successful applicant will be aged between 25 and 35, will be given further training within the Esso and Exxon organisation, and be expected to undertake overseas travel when required.

An attractive salary, along with the type of employment benefits, including relocation expenses, you would expect from a major oil company will be offered; and there are good career development opportunities within the organisation for the right person.

If you think you're the right candidate, phone Mike Walsh on Milford Haven 2321, or write to him at Esso Petroleum Company Limited, Esso Refinery, P.O. Box 11, Milford Haven, Pembrokeshire, Dyfed SA73 3SU.

HOW HIGH CAN YOU CLIMB FROM A BASE AT £7,000?

CRD

We need a

SOFTWARE SPECIALIST

with a sound basic knowledge of mainframes and minis and of high and low level languages. Knowledge of the capabilities of various FORTRAN compilers and of overlay software would be useful.

We are developing an advanced project management package written in ATSTRAN (our own FORTRAN related language). We have designed our own database system and the package is designed to run on a range of mainframes and minis.

The job is in Westminster, the work is interesting and intensive, and the starting salary is around £7,000 p.a. There are other benefits and there are alternative opportunities if your experience is less, but your FORTRAN good.

Telephone RICHARD GOULDING on
01-222 9822, Ext. 13
or send a c.v. to
COMPUTATION RESEARCH DEVELOPMENT
12/15 Dartmouth Street, London SW1H 9BL

RPGII Programmer

to £4000 (S.E. Essex)

We need an R.P.G II Programmer with at least 1 year's experience on System/3 obtained preferably in a manufacturing environment. Some C.C.P. experience would be useful.

The manufacturing data, based on our System/3 1150 is being extended into a line retrieval and update through C.C.P. This is an opportunity for a programmer with some experience to extend his/her knowledge further into manufacturing systems.

This is a secure position at one of Europe's most advanced air conditioning plants, and salaries and benefits are in line with a major International Group.

Interested men or women should write or phone: Mrs N. Rivers, Personnel Department, York Division of Borg-Warner Limited, Gardiners Lane South, Basildon, Essex.
Tel: Basildon 22231.

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YORK DIVISION OF BORG-WARNER LIMITED

ADP Network Services Ltd.

ACCOUNTS MANAGER

Excellent base earnings up to £10,000 (at target)
Company car + benefits

ADP are seeking a person already in a sales position within the computer industry to open up our NEWCASTLE office in January. The area the office covers is N.E. England.

The right person could find themselves being the AREA MANAGER within a realistic time scale.

Applicants, male or female, should ring Andy Graham on 031-225 1587 or write to:

ADP Network Services
57 Melville Street
Edinburgh EH5 7HL

UNIVERSITY OF SALFORD
COMPUTING LABORATORY

COMPUTING OFFICER

Required by the Systems section of the Computing Laboratory to provide systems support and development for the University's Computing Service on its PRIME 300/400 and ICL 1004S configuration and their external connections in the North West Universities Network.

Applicants should have some assembly language experience and a good knowledge of FORTRAN.

Salary £3883-£6555 USS Superannuation.

Further particulars and application forms may be obtained from The Registrar, University of Salford, Salford M5 4WT to whom completed applications should be returned by 31 December 1978 quoting reference CL/50/CW.

LONDON BOROUGH OF HOUNSLOW
Hounslow Borough College

DEPARTMENT OF BUSINESS STUDIES

Lecturer I to teach Business Data Processing and Computer Studies in BEC National and General Courses, also IAS, TOPS and similar fields. Statistics or Business Numeracy would also form part of this programme.

Further details from The Principal, Hounslow Borough College, London Road, Isleworth TW7 4HS on receipt of a S.A.E.

CITY OF LONDON POLYTECHNIC

SENIOR COMPUTER OPERATOR

The Computer Service provides comprehensive computing facilities for ILEA Polytechnics, Schools and Colleges.

A large multi-access real time system is installed in a self-contained computer building of the Polytechnic incorporating medium sized main store, on line disc store, a full range of peripherals and supports over 100 local and remote interactive terminals.

In addition two smaller systems provide multi-access for Schools and Colleges of the ILEA.

The Senior Operator will join a small friendly team working a two-shift system. Preference will be given to applicants with operating experience/supervisory experience in a medium/large multi-access installation. However, all applications received will be considered on their merits.

Salary offered is on a scale from £3,662 rising to £4,668 plus shift allowance of £287 p.a. Annual holidays are 21 days plus 1 day per month option day.

Further particulars and an application form may be obtained by applying in writing to the Establishment Officer, City of London Polytechnic, 117/119 Houndsditch, London EC3A 7BU.

Closing date will be 12 January, 1979.

UNIVERSITY OF SURREY

SYSTEMS PROGRAMMER

Applications are invited for the post of Systems Programmer in the Computing Unit of the University.

We are in the process of replacing our ICL 1900 equipment with a large multi-access-system. The successful candidate will be expected to work on the development of software for the new system and may also be involved with the general microprocessor applications with which the Unit is involved.

The salary will be on the scale £3883-£6665.

Further particulars can be obtained from the Staff Officer, University of Surrey, Guildford, Surrey, GU2 5XH. Telephone Guildford 71281, ext. 482. Applications, in the form of a curriculum vitae, together with the names and addresses of two referees, should reach the Staff Officer by 8 January 1979.

CAPITAL APPTS.

29, Windmill St. *London, W.1.*

GRADUATES

Urgently required for Trainee positions. Industrial, scientific and Commercial situations.

SALARIES c. £3,000
ALL AREAS

637 5557 day; 636 9659 eve.

The POLYTECHNIC WOLVERHAMPTON

Computer Centre

The Polytechnic is establishing a Computer Centre to be responsible for computing facilities and services. A large dual PRIME 400 interactive system supporting initially 64 terminals and a batch load will replace the existing ICL 1903A service in mid 1979. Additional computer staff are required and applications are invited for the posts of:

Applications Manager

£6342 - £7044 per annum including supplement.

To be responsible for the applications programming group. Candidates should have good qualifications and substantial experience of project management and control and of the needs of computer users in an educational or business and industrial environment.

Senior Programmers/ Systems Analysts

£5232 - £6060 per annum including supplement.

Candidates should have several years experience in at least one of the scientific, commercial, administrative, systems programming or user support areas, and be able to undertake programing systems design and development, and coordinate small project teams.

Programmers

£3732 - £5078 per annum including supplement.

Applicants should have a sound computing background and experience in applications or systems programming.

Further details and application forms from Personnel, The Polytechnic, Wolverhampton WV1 1LY. Telephone — Wolverhampton 27371.

SAUDI ARABIA '79

18 OPPORTUNITIES FOR PERMANENT AND CONTRACT PERSONNEL

Our Client is one of the world's leading oil companies with over 1200 personnel currently working in Saudi Arabia. The company are currently operating IBM 370s under MVS and are upgrading to twin 3033s in July 1979. Positions are open to single status male or female applicants who should ideally have a degree or 'A' levels. The Company has positions available in 5 separate areas requiring different skills. Specific background is sought in one or more of the following areas:

8 APPLICATION PROGRAMMERS

2-5 years' experience in application programming on IBM 360/370 using PL1 or COBOL. Experience of MVS, IMS/VS, TSO, and/or MARK IV desirable but not essential.

3 SCIENTIFIC PROGRAMMERS

Experience of Civil Engineering, Simulation Sciences, or Electrical Engineering with 3 years + experience using FORTRAN and/or PL1.

3 SYSTEMS ANALYSTS

2-5 years' analysis experience with either applications or scientific programming background. Ability to train other personnel, read program dumps and advise on programming techniques useful. Background should include IBM 360/370 and knowledge of PL1 FORTRAN or MARK IV.

2 SYSTEMS PROGRAMMERS

2-5 years' experience on IBM 360/370 with knowledge of MVS Systems generation and maintenance. The position will entail performance measurement and evaluation; Program product installation; IMS generation; and handling the telecommunications software. Knowledge of TSO and JES-2 useful.

This is one of the best benefit packages currently offered in Saudi Arabia — they include:

— Tax free salary
— Termination Bonus
— First-class accommodation arranged and subsidised
— Free recreational facilities — beach, tennis, etc.
— Free local transportation
— Free medical care in a modern facility
— 11 days' Public Holiday + annual leave

Client interviews will be arranged in London on the week commencing January 8, 1979. Successful applicants must be prepared to fly out late January or early February.

For preliminary interviews contact Bob Edwards immediately on 01-439 1856.

MINI PROGRAMMERS & ANALYSTS

C. London **to £7000 plus Mortgage**

An international banking organisation in the West End are seeking Basic/Basic plus Programmers & Analysts with a minimum of 3 years' experience. The company uses Dec Mini's and is currently developing On-Line Systems, so any experience in this field will be an advantage.

Salaries are high, prospects are good, and a 2½% Mortgage scheme is also available.

Reference HK50/1

FORTRAN PROGRAMMER

Middx. **to £6000**

An international company based in Middlesex are seeking Fortran Programmers with a knowledge of graphics and a minimum of 18 months' experience. The company has a range of hardware which includes a large Mainframe & several mini & micro machines. Salaries will be very good with all large company benefits.

Reference HK50/2

REAL TIME PROGRAMMERS

West End **£5000 to £6000**

One of the country's most respected Software Houses has a number of opportunities in their Real Time Systems Division based in Central London. Positions exist at all levels for Programmers & Analysts with a minimum of 12 months' experience upwards in ASSEMBLER or FORTRAN on any Real Time System.

Salaries & Career prospects are exceptionally good with plenty of variety including travel overseas.

Reference HK50/3

OPERATIONS

IBM	OS	OPS SPT	1YR	£4000
IBM	DATA 100	OPERATOR	1YR	£4900
IBM	OS	SNR. OP.	2YRS	£5000
IBM	DOS	OPERATOR	6MTHS	£3500
IBM	DOS	OPERATOR	1YR	£4500
IBM	SYS3	OPERATOR	6MTHS	£3500
ICL	GII	SHIFT LDR	3YRS	£4900
ICL	1900	OPERATOR	1YR	£4000
ICL	1900	OPERATOR	6MTHS+	£3500
ICL	2900	OPERATOR	6MTHS	£3500
UNIVAC	1108	OPERATOR	1½YRS	£4500
UNIVAC	1106	OPERATOR	1YR+	£4800
UNIVAC	90/60	SHIFT LDR	3YRS+	c £5000
UNIVAC	90/30	SNR. OP.	2YRS+	£4800
HONEYWELL	GCOS	OPERATOR	2YRS	£4700
HONEYWELL	ANY	JUNIOR OP.	6MTHS	£3600
NCR	B1, B2	SNR OP.	1½YRS	£4400
DEC	PDP10	SNR. OP.	2YRS	£4600

DATA CONTROLLERS

WE HAVE MANY POSITIONS, BOTH JUNIOR AND SENIOR AT SALARIES UP TO £6000.

Computing Services Association

COBOL PROGRAMMERS

City **to £5000 plus Mortgage**

A major financial organisation with an expanding ICL 2900 system is seeking several *COBOL* programmers. These positions will be ideal for people with 12 to 18 months' experience on any mainframe, and who want ANALYSIS prospects.

The company offers high starting salaries, Season Ticket Loans, *Flextime* and a Subsidised Mortgage.

Reference PG50/4

PL1 PROGRAMMERS

West End ***£5500* plus *Mortgage***

Running a 370/135 installation, this company requires PL1 programmers with 12 months' experience and lots of initiative. The work is varied, and will provide excellent experience for the *future*.

The package is first class, including Flexti*me*, Season Ticket Loans & a Subsidised Mortgage scheme.

Reference PG50/5

RPG II ANALYST/PROGRAMMERS

City **to £8000 plus Mortgage**

RPG II people at all levels are needed for this financial company based in the City. The experience required varies from 18 months to 5 years, covering PROGRAMMERS, ANALYSTS, and PROJECT LEADERS.

TP and Data Base work will be involved, promotion prospects are superb, and benefits include LV's, Free Pension, Season Ticket Loans, and Subsidised Mortgages.

Reference PG50/6

Datascene Recruitment Ltd
Sceptre House
169–173 Regent Street
London W1R 7FB

datascene

01-439 7871
24hour answer phone

SWINDON

SENIOR SYSTEMS ANALYST

New projects From £6,500

Our clients have asked us to recruit a mature, experienced Senior Systems Analyst, probably with upwards of eight years computing experience. The job offers:

- plenty of development work (mainly management information, accounting and financial systems at present).
- the stimulation of occasional visits to other user locations in the UK.
- leadership of one or more project teams of analysts and programmers.
- the use of both mainframe and minicomputer hardware, including communications and on-line systems.
- close involvement with positive line managers.

This opportunity will interest experienced analysts who are looking for a long-term career opening in a large successful Company with over ten years commitment to the use of major computing systems.

Please ring us for an exchange of information, quoting ref. 968. Alternatively, leave a message on our answering machine after hours and we'll contact you.

EDP SYSTEMS 01.637 5796
52-53 Margaret St. London W1N 7FF

HOW HIGH CAN YOU CLIMB FROM A BASE AT £7,000?

CRD

We need a

SOFTWARE SPECIALIST

with a sound basic knowledge of mainframes and minis and of high and low level languages. Knowledge of the capabilities of various FORTRAN compilers and of overlay software would be useful

We are developing an advanced project management package written in ATSTRAN (our own FORTRAN related language). We have designed our own database system and the package is designed to run on a range of mainframes and minis.

The job is in Westminster, the work is interesting and intensive, and the starting salary is around £7,000 p a. There are other benefits and there are alternative opportunities if your experience is less, but your FORTRAN good.

Telephone RICHARD GOULDING on
01-222 9822, Ext. 13
or send a c.v. to
COMPUTATION RESEARCH DEVELOPMENT
12/15 Dartmouth Street, London SW1H 9BL

Programmers

with Assembler experience

You are probably a Graduate with 1-3 years programming experience which may have included real time, PDP 8, small message switching systems or control systems. You are now looking to extend your experience in a more challenging stimulating environment with regular hands on activity on a wide variety of short-term real time projects which will afford you an all-round expertise.

We are The Data Systems Division of ITT, engaged in the manufacture and market of computer-based message switching systems. Our well established product range is in demand and has gained tremendous ground in this extremely competitive field. Right now, we are preparing to cope with demands for systems and facilities and this creates new opportunities for ambitious people in the general field of message switching.

We offer: The chance to improve your knowledge and familiarity with real time on a variety of short-term products, the opportunity to become totally involved from inception to completion with as much client contact as you desire, professional responsibility for each project and real prospects of career advancement within the message-switching sphere.

There may be some opportunity for UK and European travel, salaries and benefits will be highly competitive and fully reflect our position in the market.

To find out more about these opportunities please telephone Mrs F Mason, on 01-440 4141 ext 349 for an application form or write to Personnel Department, Data Systems Division, ITT Business Systems, Diversey House, 1a Chalk Lane, Cockfosters Road, Barnet, Hertfordshire EN4 AOO

ITT Business Systems ITT

Esso

MILFORD HAVEN REFINERY

If you have a degree or equivalent in electronic or electrical engineering, and have obtained solid experience in electronic instrumentation, computer system hardware and software, and interfacing computers with instrument peripherals, we would like to meet you. Specifically we are looking for a

DIGITAL SYSTEMS ENGINEER

to join a small team engaged in the design, development, start-up and operation of the process control computer systems at the refinery.

During the project engineering phase the successful candidate will monitor the computer vendor's design and manufacturing activities; interpret the refinery's system requirements to the vendor; check the full system at the vendor's plant prior to shipment, including the system software; and monitor the computer installation and start-up.

Following start-up, the Digital Systems Engineer will be responsible for computer system troubleshooting, providing a software consultation service for Applications Engineers and for the ongoing development of the system.

The successful applicant will be aged between 25 and 35, will be given further training within the Esso and Exxon organisation, and be expected to undertake overseas travel when required.

An attractive salary, along with the type of employment benefits, including relocation expenses, you would expect from a major oil company will be offered; and there are good career development opportunities within the organisation for the right person.

If you think you're the right candidate, phone Mike Walsh on Milford Haven 2321, or write to him at Esso Petroleum Company Limited, Esso Refinery, P.O. Box 11, Milford Haven, Pembrokeshire, Dyfed SA73 3SU.

RPGII Programmer

to £4000 (S.E. Essex)

We need an R.P.G.II Programmer with at least 1 year's experience on System/3 obtained preferably in a manufacturing environment. Some C.C.P. experience would be useful.

The manufacturing data, based on our System/3 1150 is being extended into a line retrieval and update through C.C.P. This is an opportunity for a programmer with some experience to extend his/her knowledge further into manufacturing systems.

This is a secure position at one of Europe's most advanced air conditioning plants, and salaries and benefits are in line with a major International Group.

Interested men or women should write or phone: Mrs N. Rivers, Personnel Department, York Division of Borg-Warner Limited, Gardiners Lane South, Basildon, Essex.
Tel: Basildon 22231.

BORG WARNER

YORK DIVISION OF BORG-WARNER LIMITED

ADP Network Services Ltd.

ACCOUNTS MANAGER

Excellent base earnings up to £10,000 (a target) Company car + benefits

ADP are seeking a person already in a sales position within the computer industry to open up our NEWCASTLE office in January. The area the office covers is N E England.

The right person could find themselves being the AREA MANAGER within a realistic time-scale.

Applicants, male or female, should ring Andy Graham on 031-225 1587 or write to

ADP Network Services
57 Melville Street
Edinburgh EH3 7HL

UNIVERSITY OF SALFORD
COMPUTING LABORATORY

COMPUTING OFFICER

Required by the Systems section of the Computing Laboratory to provide systems support and development for the University's Computing Service on its *PRIME 300/400 and ICL 1904S* configuration and their external connections in the North West Universities Network.

Applicants should have some assembly language experience and a good knowledge of FORTRAN.

Salary £3883-£5555 USS Superannuation.

Further particulars and application forms may be obtained from The Registrar, University of Salford, Salford M5 4WT to whom completed applications should be returned by 31 December 1978 quoting reference [illegible]

LONDON BOROUGH OF HOUNSLOW
Hounslow Borough College

DEPARTMENT OF BUSINESS STUDIES

Lecturer I to teach Business Data Processing and Computer Studies in BEC National and General Courses, also IAS, TOPS and similar fields. Statistics or Business Numeracy would also form part of this programme.

Further details from The Principal, Hounslow Borough College, London Road, Isleworth TW7 4HS on receipt of a S.A.E.

CITY OF LONDON POLYTECHNIC

SENIOR COMPUTER OPERATOR

The Computer Service provides comprehensive computing facilities for ILEA Polytechnics, Schools and Colleges.

A large multi-access real time system is installed in a self-contained computer building of the Polytechnic incorporating medium sized main store, on line disc store, a full range of peripherals and supports over 100 local and remote interactive terminals.

In addition two smaller systems provide multi-access for Schools and Colleges of the ILEA.

The Senior Operator will join a small friendly team working a two-shift system. Preference will be given to applicants with operating experience/supervisory experience in a medium/large multi-access installation. However, all applications received will be considered on their merits.

Salary offered is on a scale from £3,882 rising to £4,869 plus shift allowance of £287 p.a. Annual holidays are 21 days plus 1 day per month "option day".

Further particulars and an application form may be obtained by applying in writing to the Establishment Officer, City of London Polytechnic, 117/119 Houndsditch, London EC3A 7BU.

Closing date will be 12 January, 1979

UNIVERSITY OF SURREY

SYSTEMS PROGRAMMER

Applications are invited for the post of Systems Programmer in the Computing Unit of the University.

We are in the process of replacing our ICL 1900 equipment with a large multi-access system. The successful candidate will be expected to work on the development of software for the new system and may also be involved with the general microprocessor applications with which the Unit is involved.

The salary will be on the scale £3883-£5555.

Further particulars can be obtained from the Staff Officer, University of Surrey, Guildford, Surrey, GU2 5XH. Telephone Guildford 71281, ext. 482. Applications, in the form of a curriculum vitae, together with the names and addresses of two referees, should reach the Staff Officer by 5 January 1979.

CAPITAL APPTS.

GRADUATES

Urgently required for Trainee positions, Industrial, scientific and Commercial situations.

SALARIES c. £3,000
ALL AREAS

29 Windmill St. *London, W.1.*

637 5557 day/636 9659 eve.

The POLYTECHNIC WOLVERHAMPTON

Computer Centre

The Polytechnic is establishing a Computer Centre to be responsible for computing facilities and services. A *large dual PRIME 500 interactive* system supporting initially 64 terminals and a batch load will replace the existing ICL 1903A service in mid 1979. Additional computer staff are required and applications are invited for the posts of:

Applications Manager

£6342 - £7044 per annum including supplement.

To be responsible for the applications programming group. Candidates should have good qualifications and substantial experience of project management and control and of the needs of computer users in an educational or business and industrial environment.

Senior Programmers/Systems Analysts

£5232 - £6060 per annum including supplement.

Candidates should have several years experience in at least one of the scientific, commercial, administrative, systems programming or user support areas, and be able to undertake programming systems design and development, and coordinate small project teams.

Programmers

£3732 - £5073 per annum including supplement.

Applicants should have a sound computing background and experience in applications or systems programming.

Further details and application forms from Personnel, The Polytechnic, Wolverhampton WV1 1LY.
Telephone—Wolverhampton 27371.

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The company offers high sterling salaries, Season Ticket Loans, Flextime and a Subsidised Mortgage.

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PL1 PROGRAMMERS

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Running a 370/135 installation, this company requires PL1 programmers with 12 months' experience and lots of initiative. The work is varied, and will provide excellent experience for the future.
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TP and Data Base work will be involved, promotion prospects are superb, and benefits include LV's, Free Pension, Season Ticket Loans, and Subsidised Mortgages.

Reference PG50/6

Datascene Recruitment Ltd
Sceptre House
169-173 Regent Street
London W1R 7FB

datascene

01-439 7871
24 hour answer phone

JBA

PARIS
Assembler Programmer

c £12,500 pa

Fascinating work involving the interpretation and analysis of flight path patterns and other data relating to air traffic at a major European airport. Candidates must have at least 2 years ASSEMBLER experience, ideally gained on Hewlett Packard equipment, and a working knowledge of FORTRAN. A numerate degree and an appreciation of radar techniques would be useful.

This is a contractual position from 9 to 18 months but salary is excellent and the location even better. Contact: Mike Creamer

Business Systems Consultant

South London **up to £7,500**

Our client, one of the major computer manufacturers in the UK, has opportunities for Business Systems Consultants to join a pre-sales team based in South London.

Applicants should have at least four years experience in data processing with the majority of that spent in the design and implementation of commercial applications. Candidates should have undertaken feasibility studies and been involved in defining user department requirements. The Company is looking for staff with maturity, sound business background, diplomacy and the ability to meet objectives with minimal supervision.

Excellent salaries, car allowance and bonus scheme. Contact: Jim Baker

Systems Analysts

Greenford, Middx. **c £6,000 - £7,000 + bonus**

This leading U.K. pharmaceutical company is embarking on a completely new development project, establishing a network of HP 3000's which will provide on-line facilities catering for a wide range of new production, marketing and financial applications.

A few positions remain for high-calibre analysts to join the development team. Expertise in designing applications for on-line and/or database projects would be particularly welcome, although applicants with purely batch experience will be considered if their applications knowledge is relevant.

Benefits include non-contributory pension and an excellent bonus scheme. Sports and social club facilities are available (and much used), and career opportunities are superb. Contact: Andy Wright

Software Designers for Micro Based Systems

Herts **Neg to £7,500**

We have been asked by our client, a micro systems house, to assist them in the recruitment of additional design programmers. Responsibilities will embrace all software aspects of new development work and the successful appointees will be expected to make a significant contribution to the projects. Applicants must have had previous experience in either operating systems, compilers or communications facilities and be anxious to broaden their expertise to include micro-processor technology. Programmers should be able to demonstrate a substantial background in ASSEMBLER level languages.

In this dynamic and growing environment, your long term career prospects will depend very much on how committed you can be.

Contact: Margaret Stevens

Programmers

West End **up to £7,100 + benefits**

A leading overseas banking group require programmers at all levels with a minimum of one year's COBOL experience, ideally gained on IBM 370. The installation handles a number of financial applications including an on-line system for foreign exchange.

The bank offers traditional fringe benefits including a very low mortgage scheme after a settling-in period which, together with low interest loans, represents a valuable package. Very pleasant working environment and flexible approach to those who can use initiative and accept responsibility.

Contact: Mike Creamer

Micro Programmer/Designer

North West London **range £6,000 to £7,000**

If you have around three years good ASSEMBLER programming experience, preferably gained on minis or micros although any hardware experience will be considered, our client can offer you a superb opportunity to become involved in the world of micro-based business system and operating software design and development.

The successful candidate will be joining a small team of outstanding talent, so for a self-motivated individual, keen on learning new languages, design techniques, systems and applications, the prospects could hardly be better.

Salary will be paid according to experience - rapid advances can be expected.

Contact: Andy Wright

For further information on any of the above vacancies please contact the appropriate consultant.
If your qualifications do not match the above positions but you are seeking other opportunities please contact us anyway.

JAMES BAKER ASSOCIATES, International Personnel Consultants
16 Maddox Street, London W.1. Tel: 01-491 4478

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microgen

**WATFORD/LONDON/BRISTOL/
STOKE-ON-TRENT**

SALES EXECUTIVE

(SALARY + BONUS = c£6K)

MICROGEN LTD — The leading COM Bureau in the UK is looking for a person to join its sales staff in Stoke-on-Trent.

Applicants should have a background in computer systems and programming with the personality and ability to handle negotiations with clients. Whilst experience in COM sales and COM systems would be an advantage, Analysts and Programmers who would like to pursue a career in sales should also apply.

The successful applicant will join a young, enthusiastic team and will enjoy a stimulating well paid career.

A company car will be provided. If this job appeals to you ring Bill Corbishley on (0782) 410418, or write for an application form to—

Microgen Ltd.
Graphic House,
124 City Road,
Stoke-On-Trent,
Staffs.

DESIGNER/SENIOR ANALYST
SALARY UP TO £8000

To lead small team responsible for development and implementation of commercial application systems. Preferably HNC or equivalent with knowledge of financial accounting, budgeting/forecasting and/or project control, planning/forecasting. Knowledge of structural design and programming. TP and DBM desirable but not essential.

Interested applicants telephone:
Brian Phillips, SHAPCREST LTD. Caterham (22) 42383

SYSTEMS DESIGNERS LIMITED

Programmers & systems engineers in Manchester: up to £7,500

Systems Designers Limited is an independent British systems consultancy, backed by the NEB, and with an unrivalled reputation in mini and micro computer applications. Established in 1968 and currently 150 strong, the company is expanding its operations in both the UK and abroad. A full order book and continued demands for our high quality service have produced an immediate requirement for a number of professional programmers and systems engineers for our Manchester office. Current projects are challenging and rewarding and the company policy of full participation of all members offers broad prospects and opportunities for rapid progress for top people. Requirements exist for people with broad experience in the design and implementation of mini and micro computer systems using both assembler and high level languages. We are interested in hearing from programmers and systems engineers with at least four years' experience. Applicants must have good academic qualifications and a proven software ability, together with a professional outlook.

**Please write to, or telephone, Mike Bray at
Elf House, Woodlands Road, Altrincham
Cheshire WA14 1HG.
Telephone: (061) 928 9305**

Gwent
County Council

**COUNTY TREASURER'S DEPARTMENT
COMPUTER SECTION**

Applications are invited for the following posts.

1. A GROUP LEADER

To be in charge of one of the four teams of Systems Analysts and Programmers. The work includes maintenance and development of existing applications and some new projects.

Salary Scale PO1(b) £5,806-£6,513

2. SYSTEMS ANALYST/ PROGRAMMERS

To join existing teams who are working on the considerable variety of applications applicable to a local authority.

Salary Scale SO1/2 £[illegible],232 £[illegible],060

The persons appointed should preferably be qualified by examination and have a minimum of five years' experience in computing.

Gwent operates a 370/148 with 3350 disk storage. The main programming languages are PL1, ASSEMBLER and FORTRAN in order of use. Candidates should have experience of these languages and I.B.M. operating systems.

Assistance will be granted towards removal expenses etc.

Applications to be submitted by 28th December, 1978.

Application forms and further information (where applicable) for the above vacant posts can be obtained from the Personnel Section, Gwent County Council, County Hall, Cwmbran, Gwent NP4 2XH, to be returned by the date shown to the same address.

APPLICATIONS PROGRAMMER
RESEARCH ASSISTANT
SPATIAL ALGORITHMS PROJECT

Applications are invited for research staff on an SSRC-funded interdisciplinary project to investigate computer algorithms for spatial data problems and to implement a portable software library. Two posts are initially available.

PROGRAMMER at the UNIVERSITY OF EAST ANGLIA, NORWICH responsible for initial algorithm investigation and implementation. Candidates should have appropriate programming experience. FORTRAN would be an advantage.

RESEARCH ASSISTANT at UNIVERSITY COLLEGE LONDON responsible for implementing, testing and documenting algorithms on a range of machines. Research and programming experience essential.

These appointments are for 2 years only on the following scales: Programmer £3,883 (first year) and £4,133 (second). Research Assistant £4,600 and £4,858 (salaries under review), both posts with USS benefits.

Applications, with the names of 3 referees, should be received by 12 January: for the programmer by the Dean, School of Computing Studies and Accountancy, University of East Anglia, Norwich NR4 7TT, for the research assistant by the Assistant Secretary (Personnel), University College London, Gower Street, London WC1E 6BT. Further particulars for the respective posts may be obtained from the above.

PROGRAMMERS
SENIOR PROGRAMMERS
GET SET FOR '79

Leeds **£4250 to £5250**

Our client a major computer user wishes to recruit additional programming staff with at least 12 months COBOL experience on any mainframe.

The work is truly stimulating including real-time and database applications and the opportunities for advancement are outstanding.

Rewards to successful candidates will be:

- Starting salary from £4250 upwards depending on seniority.
- First class benefits.
- Relocation expenses.
- Continuous training in advanced techniques.

Contact Ivor Norton quoting Ref c'78102 to arrange a local interview near your home or place of work.

Ivor Norton Management Services Ltd
Recruitment Consulting Division
[illegible] Avenue, London W1V [illegible] [illegible] (24 hour answering service)
P.O. Box 63, Copthall Tower House, Harrogate HG1 1TS, Tel. Harrogate 66028

Camden's Growing!
Get In Now

With an [illegible] London Council needs to recruit the following staff for its [illegible] installation. Fourth generation [illegible] and as soon as [illegible] placed full training will be given to all staff.

Senior Systems Analyst

In a [illegible] systems [illegible]. [illegible] years supervisory systems experience required. Salary on a scale up to £7,[illegible] p.a. (incl.) Ref. No. R/[illegible]/CW

Project Leader

To lead team of [illegible]. Three years' systems experience required. Salary on a scale up to £7,[illegible] p.a. (incl.) Ref. No. R/[illegible]/CW

Analyst / Programmer

[illegible] Specialist. [illegible] Must be [illegible] in COBOL, PLAN etc. Salary on a scale up to £6,[illegible] p.a. (incl.) Ref. No. R/[illegible]/CW

Programming Team Leader

To lead team of five programmers. At least three years' 1900 programming experience required. [illegible] good. Salary on a scale up to £6,[illegible] p.a. (incl.) Ref. No. R/[illegible]/CW

Senior Programmers

Applications programming in [illegible]. Two years' relevant experience required. Salary on a scale up to £6,003 p.a. (incl.). Ref. No. R/[illegible]/CW

Programmer (Career Grade)

For the person not quite [illegible] a Senior Programmer's post. Salary on a career grade up to a maximum of £6,508 p.a. (incl.) Ref No R/62/CW

Jobs in a friendly unit working on widely varied applications located at just about the easiest travel spot in London, King's Cross. All the generous benefits and security usually associated with Local Government employment.

For application form please telephone our 24-hour recruitment answering service 01-837 9968 or send postcard to the Chief Executive, London Borough of Camden, Town Hall, Euston Road, London NW1 2RU, stating post and appropriate reference number.

camden - an equal opportunity employer

Applicants are considered on the basis of their suitability for the post regardless of [illegible] marital status. [illegible] disabled persons [illegible] encouraged to apply.

UNIVERSITY OF SOUTHAMPTON
Institute of Sound and Vibration Research

ENGINEER & PROGRAMMERS

ENGINEER

A software application engineer is required for the development of programs for real time data processing and statistical analysis. This will involve assembly and higher level languages based on a DEC PDP 12 system. The work is in connection with the development of diagnostic procedures in hearing and neurological disorders using on-line measurements from patients and forms part of the work of an M.R.C. supported team.

This position is for 3 years at an appropriate salary in a range up to £6,367 (under review) dependent on age and experience.

Reference Number 387/A/CW

PROGRAMMERS

Applications are invited from experienced programmers to join a new software team being formed for the Data Analysis Service in the Institute of Sound and Vibration Research to extend the existing real-time PDP11/55 into a dual processor configuration in preparation for networking.

Programmers are being recruited to take responsibility for developments in the following four specialities:

OPERATING SYSTEM:
Enhancing the performance of the RSX11 M operating system used in the 11/60 and 11/34

DATA ACQUISITION:
Communications and signal selection modules including ADC and VDU terminal drivers and plotting facility.

UTILITIES:
Structuring and manipulation of files and data bases, graphical presentation of data

ALGORITHMS:
Implementation of theoretically proven algorithms for time series analysis.

Salaries offered will be up to £8,555 per annum for systems work and up to £6,604 per annum for the other vacancies (scales are currently under review). U.S.S. Superannuation benefits. Part-time appointments may be possible by arrangement, at appropriate pro-rata salaries. *Reference Number 178/A/CW*

Further information on each post may be obtained from D. A. S. Copland, The University, Southampton SO9 5NH, to whom applications giving a brief curriculum vitae and the names of three referees should be sent quoting the appropriate reference.

NEWSFLASH!
We have a bumper selection of jobs for all levels of
COMPUTER STAFF
VIP
Call VIP Consultants on 01-491 [illegible]

LOGISTIX
Data Processing Recruitment Consultants

Real Time Programmers
Scandinavia & Spain

Salary: £14K plus benefits

The leading Scandinavian Systems and Turnkey Supplier with offices in Scandinavia, Nigeria and California requires FORTRAN and/or ASSEMBLER programmers for its home based and Spanish operations. Whilst the applications under development are sophisticated Real-Time projects previous experience of Real-Time is not absolutely essential but in-depth FORTRAN and ASSEMBLER programming expertise is a pre-requisite. Preference will be given to those candidates who have very recent or current experience on UNIVAC 490/4 or UNIVAC 1100 series.

Willingness to relocate to Scandinavia or Spain for an extended period is absolutely essential and to assist you in your removal our client will meet all relocation expenses in addition to providing initial paid accommodation.

Interviews will be held at our London offices in the New Year.

Ref. 37/A

U.K. Re-Insurance Group
City of London

Salaries: £6K — £9K + mortgage

A major U.K. Insurance and Merchant Bank Group with a recently acquired U.S. based subsidiary with extensive and soon to be upgraded Computer facilities in the City requires additional D.P. personnel up to PROJECT MANAGER level.

Ideally you will have around 3 years of continuous PL/I programming experience under OS and/or MVS and will either have on-line expertise or a desire to move into this area or Data Base design through participation in our clients training programmes.

Of particular importance is the ability to work as a member of a Specialist Project team under strict documentation and programming standards. A second language — ASSEMBLER or COBOL — would, in addition be of considerable advantage for the fulfilment of career aspirations. Our clients offer a low cost subsidised mortgage, private health and non-contributory pension scheme plus excellent restaurant facilities. Interviews will be held at the Company's offices in mid-December.

Ref. 37/B

Process Control Specialists
West Germany

Salaries to £15K

Much of the forefront development in Process Control Software emanates from Western Europe and if you aim to move into frontier technology the opportunity arises to join a highly reputed Systems and Software Development Group engaged in exciting pioneering projects in the areas of:-

Robotics, Artificial Intelligence, Industrial Control Systems or Liquid Flow Monitoring Systems.

Existing and new project teams require Consultants, Systems Designers, Senior Analysts, Analyst/Programmers and Programmers with direct and relevant experience in at least one of the above spheres of activity. In particular, extensive Mini Computer Assembler is essential, and a degree or equivalent would be an advantage.

You are certain to contribute valuable expertise to this prestigious group whilst expanding your own threshold of experience through working closely with other professionals at your own level. Our client will pay full relocation expenses for you and your family and provide a generous resettlement advance in addition to meeting the costs of temporary accommodation pending location of permanent housing.

Ref. 37/C

Database Project Leader
Copenhagen

Salary: c. £14K

We are requested to recruit a Project Leader ideally 27-35 years offering an in-depth knowledge of both Data-Base and Teleprocessing techniques in an IBM environment.

The successful candidate will be required to demonstrate current programming and design exposure in the implementation and support of Data Base and/or Real Time Systems having particular involvement with IBM's own software IMS, CICS, TSO or the products of the independents, namely CINCOM'S TOTAL/ENVIRON; ALTERGO'S SHADOW/QUOTA or ADABAS, whilst for Univac orientated personnel DMS 1100 knowledge is essential. Your past experience should have included PL/1 or COBOL programming and design and analysis experience within a financial or commercial environment.

Supplemental to a high salary you will receive additional benefits including married or single staff accommodation, full relocation expenses, life and disability insurances.

Ref. 37/D

Systems Designers + Programmers etc.
London + Cheshire

Salaries: £6—9.5K (a.a.e.)

A very prestige client with headquarters in London and regional offices located in Cheshire and throughout Europe urgently requires the following: Real-Time and on-line Programmers, Systems and Data base designers and compiler specialists with 2 - 5 years experience.

Of particular interest would be people with relevant experience in one or more of the following: IBM or ICL with Assembler, PL/1 or COBOL and Ferranti, DEC with Basic, RTL II or Coral. Also IMS or similar and Data Base design personnel are urgently sought.

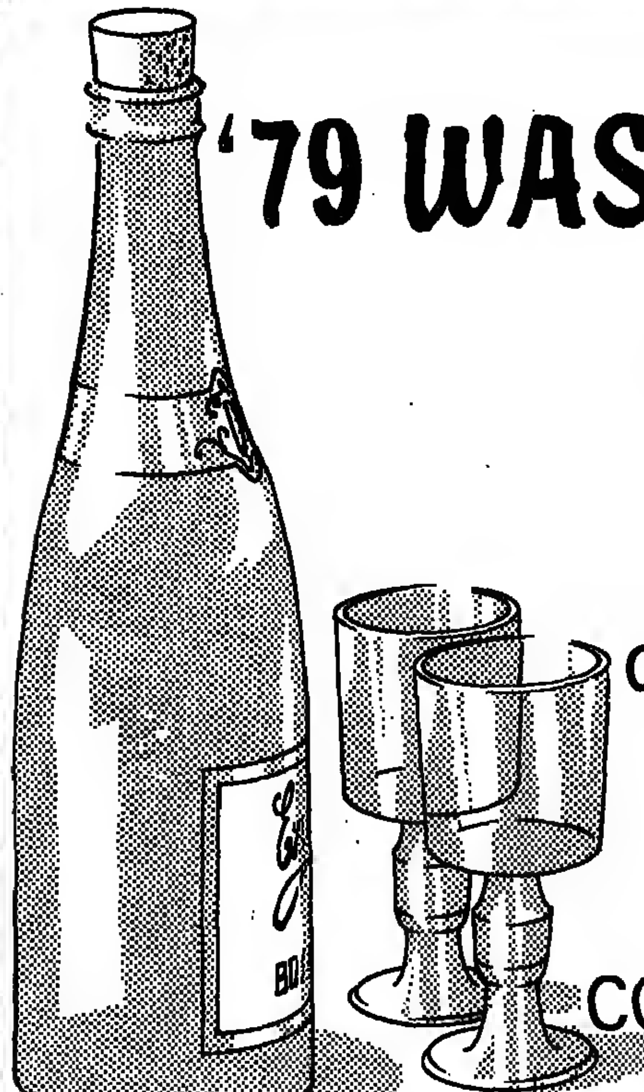
The scope of projects is both broad and demanding and certainly in keeping with the prestige of this client. You will play an important role in project development and the opportunity to enhance your technical expertise is one of the attributes of working with this reputable group. Fringe benefits are well above average and full relocation expenses will of course be met.

Ref. 37/E

Logistix, Freepost 32, London W1E 3YZ
01-491 4636 **Telex 28800**
(Reverse charges)

LOGISTIX

Avon House, 356 Oxford Street, London W1N 9HA



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With consistent growth of Altergo over the past few years we know that 1979 is going to be a busy year with our Clients requesting help on a variety of projects. We need more people from a wide range with IBM experience.

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Please talk to us by telephoning Roger Perkins to arrange a meeting on 01-734 9681 office hours or evenings and weekends on 049-481 2713 or write to him at Altergo (Personnel) Ltd., Warwick House, 38 Soho Square, London W1V 5DP.

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OCC Computer Personnel Limited

16, Bedford Row,
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01-242 9356.

If these openings sound interesting, please ring Neville John on 01-242 9356 (day) or Farnborough (Kent) 52880 (evenings and weekends) to discuss matters further. Alternatively, write giving details of your background and experience.

Management Consultants

London base with overseas travel

An international, British based Management Consultancy, markets and implements a comprehensive inventory planning and control package.
This package has been successfully implemented on a batch basis on IBM S/3, ICL2903 and on larger machines in more than 100 organisations worldwide.

An interactive version of the product is now to be developed jointly by our client and a US based consultancy, and this has created the need for additional staff. They will join a London based group which is responsible for:

- developing new and improving existing software
- providing marketing and implementation support to the organisations' consultants world wide

The new staff may be involved in any aspect of the group's activities, and need to be prepared to travel at short notice to various overseas sites in a support role or to the US in connection with the new software developments.

Systems Consultant

£7,000-£8,000

Manufacturing Systems

Aged 26-32, candidates will be graduates with at least five years in the computer industry. They must be capable of programming well in COBOL, although programming is only a small part of the job. Systems design experience and a thorough knowledge of manufacturing systems is essential. On-line experience is desirable. A suitable candiate could now be working as a systems analyst, an analyst programmer, a consultant or as a DPM at a small installation. The demands of this consultancy position require personal qualities of maturity, adaptability, self confidence, fluency etc., which are at least as important as the technical background.

Programming Consultant

£5,000-£6,000

Candidates for this position are likely to be graduates in their early 20's, with 18 months or more practical COBOL or RPG II experience gained in a professional environment with a background of good formal training. Experience with a computer manufacturer, an established software-house or at a well run user installation would be acceptable. Personal qualities are as important as the technical experience, since the person appointed will be expected to develop in due course into a full consultancy role.

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Computing Services Association

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to £5000 pa

BEDFORD **Ref. B25**

This is an interesting opportunity for an experienced person to take charge of a small computer installation. You should have operations experience of mini computers, and preferably some knowledge of programming/software on minis, although not essential.

This is a position for a confident, self-assured individual, capable of using initiative, together with the ability to "manage". The Computer Supervisor reports directly to the Financial Manager.

The main areas of responsibility will be the supervision and operation of the system and 5 staff, and includes encoding equipment, input/output data control, scheduling, distribution, and liaison with software suppliers. The hardware is a Philips 410 disk based system, with applications covering general accounting routines and a management information system.

The company is based in Bedford, a subsidiary of a major British organisation.

Applications, which will be treated in the strictest confidence, should be made to:

X. CALIBUR CONTRACT SERVICES
DUKE HOUSE, 2 DUKE STREET, BEDFORD
Telephone: BEDFORD 48577

Computing Services Association
Agency Licence SE(A) 3345

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All classified copy should reach our offices no later than 5.30 p.m. on the Monday preceding Thursday's publication.

If complete artwork is supplied 10 a.m. on a Tuesday.

Ring David Abbey for further details on 01-261 8016.

DERBYSHIRE CONSTABULARY

Applications are invited for the following post at Force Headquarters, Ripley, Derby. Job descriptions are available.

SYSTEMS ANALYST

The salary will be in accordance with the N.J.C. Scale S.O. 1/2 £4,920-£5,748 per annum plus £312 per annum supplement.

The successful candidate will be required to form part of a newly created computer project team.

He/she should have a programming background, preferably in real time systems, with a working knowledge of a low level language.

He/she will be required to assist in the evaluation, design and implementation of major systems under the direction of the Project Manager. The work will involve the design and development of dedicated on-line computer systems for the Derbyshire Constabulary which will include police command and control and information systems, from feasibility to implementation, and thereafter continuing systems development and maintenance. Also liaison with the local authority in connection with the design and development applications on their main frame I.B.M. 370/145 computer.

A degree or appropriate professional qualification is desirable.

Application forms from the Chief Constable, Force Headquarters, Butterley Hall, Ripley, Derby, to be returned without delay.

Doing a great job for Derbyshire

THE SALES AND MARKETING BIT

Essential to see as well as hear buyer's reaction

THE ability to read minds would be a tremendous asset to any salesman (particularly in the context of his sales manager!).

Yet a degree of skill in assessing what is happening in the buyer's mind is essential if sales success is to be consistently achieved. It is all a matter of sales sensitivity and attention to detail.

Most emotional fluctuations are reflected in some physical interaction, and in most instances the interpretation of these outward manifestations is obvious. By and large people don't scowl and stamp their feet because they are pleased — and so on!

Therefore, in the selling situation, it is essential that the salesman sees as well as hears the buyer's reaction to the sales dialogue.

Take for instance, the situation where the buyer suddenly leans forward attentively. That usually means the salesman has said something which interests him.

Maybe a solution to one of his problems? A facility he wants but didn't know existed? A need which the salesman's product can satisfy?

Whatever the reason, that kind of physical movement is usually a selling signal (a popular US term for this phenomenon is the "hot button") which usually means that the salesman should be attempting a "full" or "trial" sales close, having "homed-in" on the point of interest.

And what about the buyer who switches from a smile to a frown? At the very least he disagrees with what is being said. At the other extreme he could be upset, offended, even insulted. The salesman who does not react to this type of selling signal could well be talking himself out of the business.

Take, for instance, the buyer who at the end of the salesman's presentation and perhaps some ensuing dialogue collects up the sales literature and puts it into a neat pile on his desk.

Is he subconsciously saying, "I now know sufficient about this product to enable me to buy it if I so desire?" Probably, so there is only one thing for the salesman to do — ask for the order.

What about the buyer who is constantly looking out of the window, doodling on his thumbnail or attempting to disprove the Theory of Relativity on his five quid pocket calculator? Something has to be wrong.

Apart from the obvious conclusion that salesman is boring him, it is essential to find out why. No requirement for the salesman's product? Ineffective presentation? Wrong department? There has to be a reason. The solution is obvious — ask!

The range of selling signals is enormous when one thinks about it. The buyer is constantly consulting his watch. Is he really paying attention? Would it be best to get out now and come back some other time, or does he simply want to give the salesman the order as quickly as possible so that he can be on time to meet his Aunty Mildred for lunch?

The answer is simple — ask! "I want to be sure you have sufficient information to enable you to buy my company's product. My presentation of all the relevant facts will take me a little while longer. Would you prefer me to come back next week or do you feel you have sufficient information to make a decision in our favour now?"

There are so many selling signals which reflect a whole range of emotions from excitement to absolute boredom.

It is the salesman's job constantly to look out for them and react accordingly, and that reaction should almost always be in the form of a relevant question, which is designed to lead to the sales close.

So the next time a client leans forward enthusiastically, do get ready to ask him for the order, and if a prospect is tapping out morse-code on his desk with one hand while playing solitaire with the other, do take the hint.

TRADER

PRODUCT NOTES

Interface

COMPUTER graphics and memory products manufacturer Calcomp has introduced a dual port RS 232C interface for use with its range of digitisers.

Using the interface, any Calcomp digitiser can communicate independently with both its host computer and a graphics terminal in either direction. This provides the digitiser with interactive capabilities without any of the commonly found sacrifices in accuracy.

With most other video terminal-based digitising systems the CPU only receives the amount of data which the screen itself can accommodate.

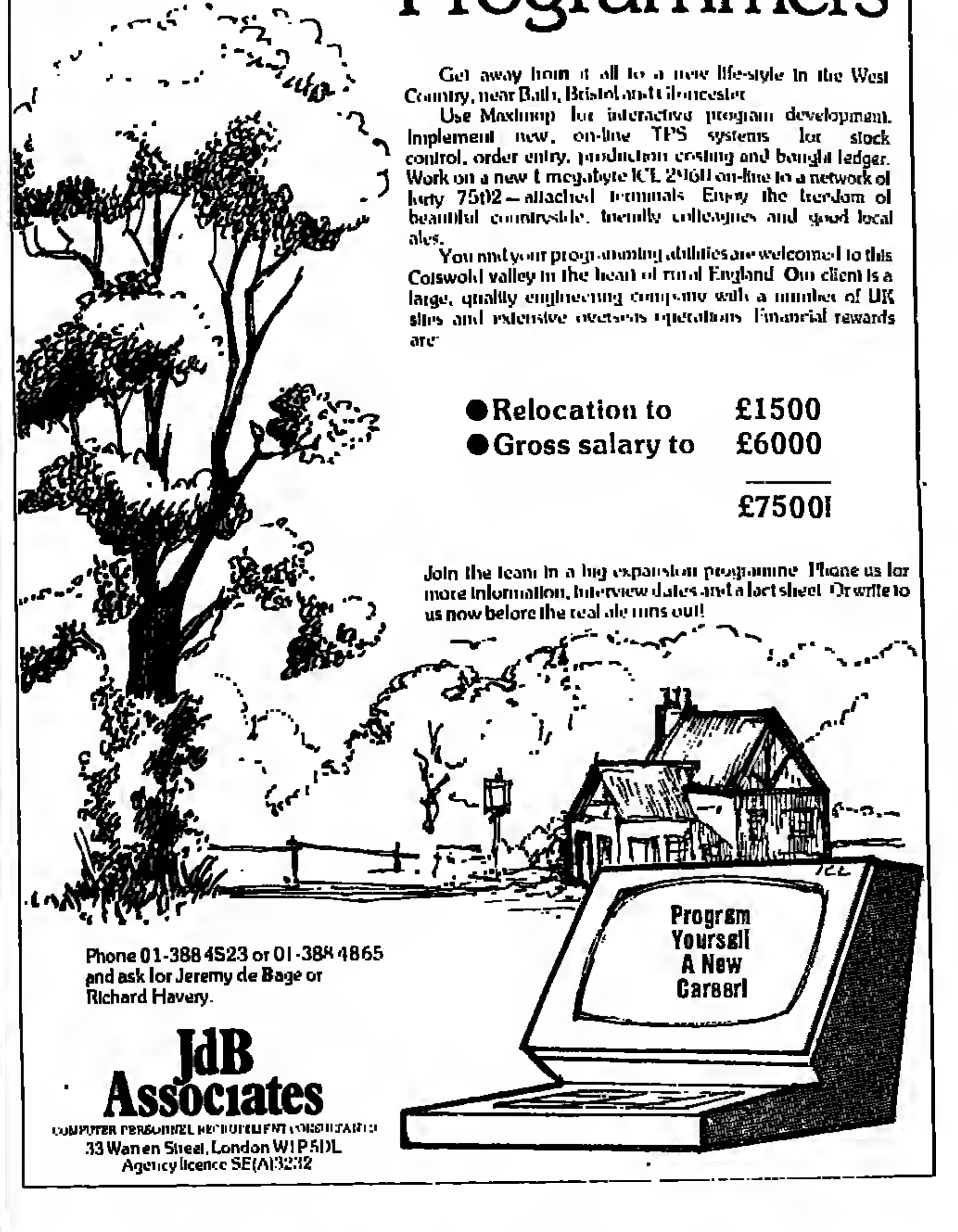
In cases where a large or high resolution digitiser is required the amount of data could be many times greater than screen capacity. This means that the user is seriously restricted in the level of accuracy to which he can work, Calcomp pointed out.

With Calcomp's new system the CPU and terminal are independent, so there is no such restriction. Consequently all digitised data is received by the host computer which allows full use of all capabilities of the digitiser. It costs £825.

Calcomp Ltd (CW), Cory House, The Ring, Bracknell, RG12 1ER. Tel: (0344) 50211.

Puzzle Answer

THE Magic Multiplier is 6,660.



Ascii through the Logic Gate

An epic in 32K words, by Richard Forsyth

Block 23 (A Chip off the Old Block)

Hex and McNull have burst into the inner sanctum of the Error Squad at Fort Ranfour while Glitch and Extracode are debating the merits of the applicants to fill Kludge's position as Dynamic Debugger.

"WELCOME," said Extracode. "I have been expecting you."

"Where's Simula?" Hex demanded.

"By now she should be back in Base 16. We let her go home."

"I don't believe you."

"You are entitled to your beliefs; but she is not in the building. If you wish, I will conduct you to her empty room."

"Just arrange for her to be here within two hours or I'll blow your heads off."

"It shall be done."

"Wait a minute!" interjected Glitch. "We're not caving in to this arrogant upstart."

"I thought it would be a touching reunion," replied the mephistophelean inspector. "Still, I shall do my best to ensure she has a cell adjacent to his while he waits in the low-priority run-queue (Death Row we call it) for execution."

"I don't want to have to say it again," insisted Hex, repeating his ultimatum. "Either you do as I tell you or I'll disassemble the pair of you."

"I'm sure we're both prepared to make that sacrifice in the course of our duty, if necessary."

"I'm not leaving without her," said Hex, levelling his terminator at Extracode.

"You're not leaving at all," replied the inspector. "You don't seem to realise that you're in the wrong place at the right time. You'll find it a lot harder to get out than you did to get in." So saying, he pressed a button on the desk and a semantic net fell from the ceiling, enveloping Hex and his disciple.

Hex struggled with all his might, but his limbs were enmeshed in the elaborate criss-cross of folds and pleats. The more he fought the more thoroughly entangled he became. At length he subsided into impotent stillness. The weapon slipped from his grasp.

Glitch rounded on Extracode. He feared that events were overtaking him and wanted to reassert his authority. "I want a pretty good explanation of all this, and I want it now."

"Certainly, but shall we call in the guards first? We don't want the Hexadecimal Kid pulling another Houdini stunt, do we?"

Glitch strode to the door and called down the corridor. There was a clatter of metallic feet as several heavily armed palace guards rushed to heed his command. When he had stationed a robot at each point of the compass around Hex and McNull, Extracode began his explanation.

"When I was put on this case, I had no preconceptions. As I investigated, it became increasingly obvious to me that this young good-for-nothing was able to inflict damage upon the prestige of the System, and especially the Error Squad, chiefly because we accorded him a respect he plainly did not deserve.

"I decided to look for a chink in his armour, the Achilles heel of our fearsome adversary. I uncovered not one weak spot, but so many that it was hard to know where to strike. My mind was made up for me, however, when I was entrusted the task of interrogating the ever-attractive Simula Begin."

Hex squirmed on the floor as this name was mentioned.

"As you know, I am a keen student of human, humanoid and inhuman psychology. The interplay of motives has always fascinated me, as I believe it should any detective who takes his vocation seriously."

"Get on with it," cut in Glitch.

"Yes, well, the very charming Ms Begin presented me with an opportunity too good to squander. She was torn between her former loyalty to Hex and her desire to act for the good of the System. It was only too clear that she would seek some sort of compromise.

"I implanted in her mind the suggestion that we planned to use her as bait to lure Hex into our hands. I knew that she would first try to warn him off and only afterwards co-operate with us. Moreover, I knew from a study of his record that no plea or invitation, however eloquent, could be as effective in luring him towards us as an urgent warning to stay away — coming as it did from his ex-lover in a state of considerable anxiety.

"The rest was simple. I had some copper wire placed in her bedroom and monitored the appropriate frequencies. I instructed the guards to pretend to swallow whatever cock-and-bull story he concocted in his attempt to gain admission to the Fort, though not of course to let him pass so easily in the opposite direction. You see the result for yourself."

Glitch was reluctant to bestow the praise that Extracode thought his tour de force deserved, but he could hardly complain. "It's all very well to circumvent operational procedures when you succeed," he admonished his colleague, "but if you fail the consequences could be dire."

At Glitch's behest, Hex and McNull were herded out down to the deepest part of the fortress. There they were bundled into a dank unlit dungeon. The gate clanged behind them, and they were alone with their thoughts.

Hardly had their eyes become accustomed to the gloom, however, when the outer door was flung open again. Two robot warders burst in, conversing excitedly. Hex had been summoned to the Data Processing Manager, beside whom even Glitch and Extracode paled into insignificance.

He was led up to the top floor. A mahogany-veneered door slid open with a faint sigh and his escorts stood back to let him pass. He stepped into the office. It was utterly bare. There were no furnishings or fittings of any kind. White fluorescent light shone down with equal intensity from the ceiling and all four walls. Looking down, he saw that he cast no shadow. He waited for the DPM to appear.

A disembodied voice filled the room.

"Do you know why you're here?"

Recognition was instant. There could be no mistake. It was the voice of his father, Abraham Synapse.

Is it? Continued next week.

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PRODUCT NOTES

Lear Siegler range additions

TWO video terminals, a matrix printer, a low cost 16-bit CPU for OEMs and a low cost small business system have been added to Lear Siegler's range.

The ADM31 is a microprocessor controlled video terminal with two pages of memory, editing facilities, synchronous and asynchronous communications features and interfaces for RS 232C and 20 milliamp loops at speed from 75 to 19,200 baud. The terminal has upward software and hardware compatibility with the existing Lear Siegler ADM1A.

The ADM42 is a microprocessor controlled video terminal capable of a high level of interaction between mainframe and terminal. It has editing and buffering facilities with a 4K byte memory expandable to 16K bytes.

The 15 inch monitor, keyboard and the logic units are stand-alone units and the keyboard provides a full 128 Ascii character set plus 16 function keys with shifts giving 32 function sequences. Each one can be programmed from the keyboard.

The screen has a capacity of 1,920 characters in 24 lines of 80. The 25th line is used for status, error messages and special host requirements. Transmission can be synchronous and asynchronous, point to point and multi-drop.

The 300 Series matrix printer is microprocessor controlled and features a patented ballistic print head. This, Lear Siegler claimed, would reduce drag, minimise wire tip wear, help eliminate clogging and increase head life.

There is a full 128-character Ascii set, elongated character capability, 10 pitch and 7 x 8 matrix with true underlining and lower case descenders. Up to six-part stationery can be used.

The 300 Series can print bi-directionally at 180 cps, tabs over spaces at speeds of 50 inches per second and incorporates a 2,048 character serial data buffer for quick dumps of full, 1,920 character screens. It is available with parallel, serial RO and serial KSR interfaces having RS 232C and 20 milliamp current loop capabilities.

The VDP-410 is a low cost, 16-bit CPU and was designed as a building block for systems development.

The VDP-410 is a low cost, 16-bit CPU and was designed as a building block for systems development.

The basic system consists of a CPU with a 200 nanosecond instruction cycle time, a 16-bit 32K word memory with a 600 nanosecond access time and I/O capabilities for communications with three external devices.

The CPU also includes an extension port with serial/parallel I/O capabilities. The VDP-410's instruction set, memory organisation and I/O architecture are designed to be compatible with operating systems, available as standard packages from leading software houses.

Designated the VDP-1000 Data System, this small business system was designed to provide large-scale programming in Basic and Cobol.

The system includes a 16-bit CPU, 32K words of dynamic RAM, an ADM-3A video console, a Lear Siegler 180 cps bi-directional ballistic printer and a choice of either a 10 Mbyte cartridge or 1.25 Mbyte floppy disc as standard.

The VDP-1000 incorporates a powerful virtual memory operating system, Vmos, with an extensive instruction set. This gives the system an operating system and complete application programme resident on its disc. Both are automatically brought into the system in segments as required.

Lear Siegler Inc (CW), 207 Frimley Road, Camberley, Surrey. Tel: 0276 66028.

For man who has everything

FOR the man who has everything are gold plated versions of Decimo's Goldfinger and World Traveller calculators, both of which are supplied in a leather case.

The Goldfinger costs £40 and measures 12 x 7 x 1 centimetres (4.78 x 2.78 x 0.38 inches) and has mathematical keys in addition to the normal function keys.

The World Traveller costs £60 and measures 11.8 x 8.7 x 0.6 centimetres (4.72 x 2.66 x 0.24 inches). In addition to the keys on the Goldfinger, it has facilities for giving the time, date, day, am/pm, bleep alarm and can be used as a stop watch.

Decimo Ltd (CW), 4-18 Chobham Street, Luton, LU1 3BS. Tel: 0582 38881.

Interface

A PARALLEL interface card for the Philips/Mullard 115DR matrix printer is now available from Datec of Altrincham, Cheshire. Called the DMI15 the card can control, drive and power the 115DR and can handle data input in 6 or 7-bit parallel, character serial, synchronous, TTL or CMOS compatible form.

The character generator uses a PROM which enables the 64, 96 or 128 character set to be specified by the user. Characters can be single or double width.

Datec Limited (CW), Tudor Road, Altrincham, WA14 5TN. Tel: 061-941 2381.

From The Shannon Ltd is a rack for storing bound volumes of print-out and is designed for ease of access and replacement.

Named desk reference rack, it has a capacity of 10½ inches and can hold up to seven volumes. It can be sited anywhere and takes up little space.

The Shannon Ltd (CW), St Margaret's Road, Beckenham, Kent. Tel: 01-658 2288.

Micro-based digitiser

A MICROPROCESSOR controlled digitiser, the 600A, that does not need a host computer is now available from Calcomp. The 600A provides the user with up to 70 firmware-held subroutines any one of which can be selected by placing the digitiser pen on the appropriate square on the digitising surface.

Functions that can be handled by the microprocessor include document skew compensation, output data formatting and linear and area calculation. An optional display terminal can be used with the 600A to display processed data and program instructions and to prompt the operator. Another option is a cross hair cursor with a 12-button keypad.

Calcomp Ltd (CW), Cory House, The Ring, Bracknell, RG12 1ER.

Double diskettes

DATA can be recorded on both sides of two diskettes that have been announced by 3M. Called the 740/2 and 740/2-32 they are double sided versions of the 3M 740 and 740-32 diskettes.

The 740/2 is compatible with IBM format, while the 740/2-32 is compatible with the drives that require 32-hole mechanical indexing such as those manufactured by Shugart Associates.

The diskettes each have a capacity of more than half a million characters and are held in envelopes with colour coded write-on labels.

IBM United Kingdom Ltd (CW), 380-384 Harrow Road, London W9 2HU.

200K byte cassette recorder

A MICRO based data cassette recorder, named DKB 200, with a capacity of 200K bytes, has been introduced by the Swedish firm, AB Tele-Ekonomi.

Protection against accidental recording is provided by a plastic tab underneath the cassette. As the first character is about to be written, the DKB 2000 automatically searches for entry space on the tape; thus overwriting is avoided.

Buffering, formatting and read/write checks are built in as standard. Interfaces for V24, RS 232C, Facit and Decitek protocols are available ex-stock and the manufacturer quotes delivery dates of between two and three weeks.

AB Tele-Ekonomi Graphic Products (CW), Hardemogatan 1, S-124 44 Bandhagen, Sweden.

Pop-up floppy disc rack

A POP-UP rack for storing floppy discs, named Disk Ref, has been introduced by Wilson Jones data systems division of Sandhurst Stationers.

The unit will accommodate up to 10 discs and allows the operator to read the labels on each floppy for ease of identification.

Wilson Jones data systems division (CW), Sandhurst Stationery, Spindle Way, Crawley, Sussex. Tel: 0293 22215.